Community Acquired Pneumonia (Uncomplicated)

NEMOURS CHILDREN'S HEALTH

DELAWARE
Primary Care/ ED

Inclusion Criteria: Suspected uncomplicated community acquired pneumonia in patients >90 days old

Exclusion Criteria:
- Complicated Pneumonia[2]
- Immunodeficiency
- Risk for aspiration
- Lung disease other than asthma
- Prior/current trach or vent dependent
- Empyema or lung abscess
- Significant cardiac anomaly
- History of Vaping
- Malignancy
- Neuromuscular Disease
- Sepsis
- Sickle Cell Disease

Targets:
- Increase Amoxicillin/ Ampicillin as 1st line ABX in all settings
- Decrease the duration of ABX to ≤ 7 days (5 days preferred for outpatient)

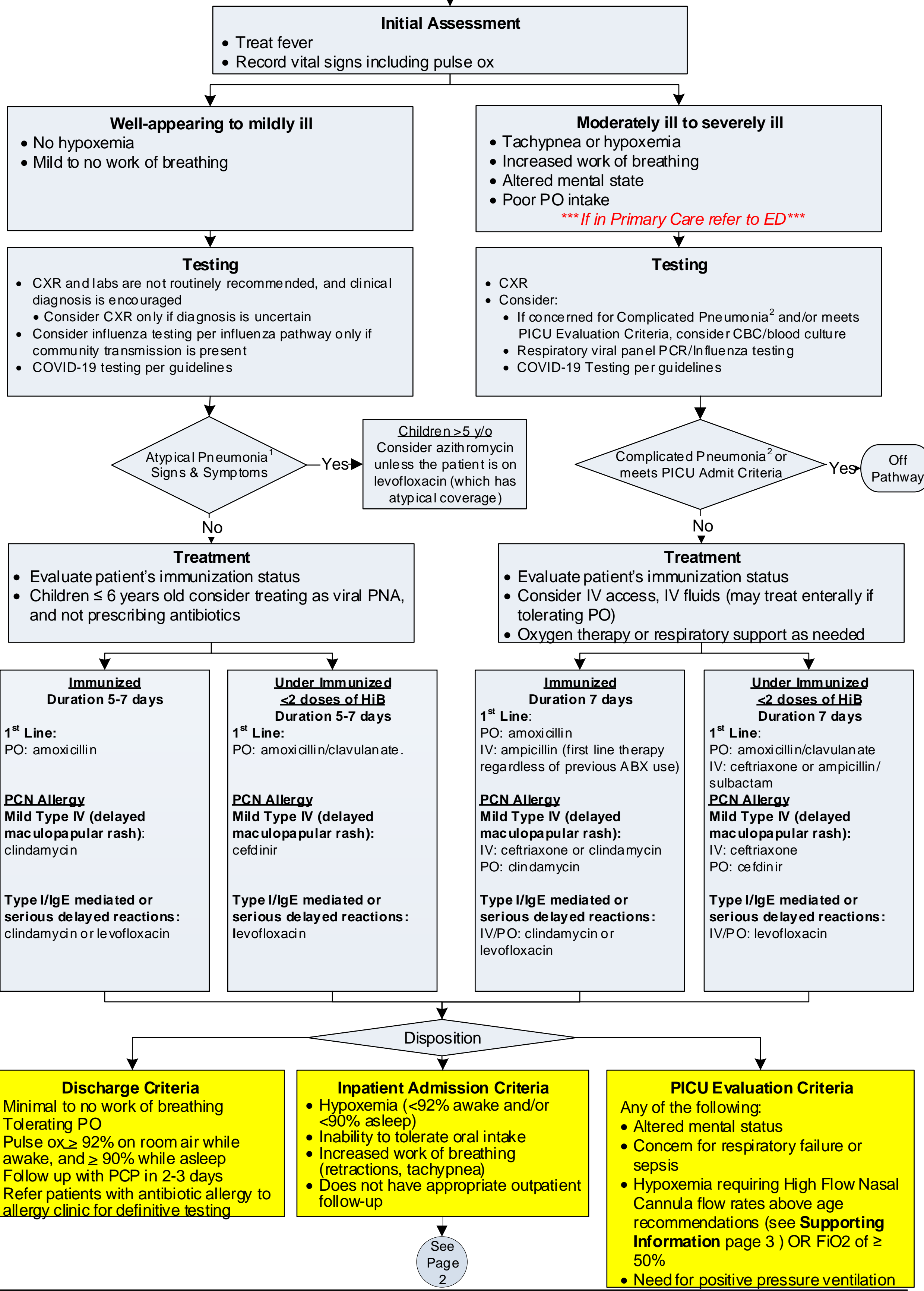
Chest X-Ray (CXR)
- Not necessary for the confirmation of suspected CAP (Well-appearing mild disease)
- CXR does not differentiate between bacterial and viral etiology

[1]Atypical Pneumonia Signs & Symptoms
- > 5 y/o
- Prolonged S/S > 7 days
- Headache or malaise
- Non-focal exam

[2]Complicated Pneumonia
- Opacified hemithorax
- Moderate/ large effusion (>¼ of the thorax)
- Empyema
- Lung abscess
- Necrotizing pneumonia

Treatment Failure

Consider admission for increasing respiratory distress, respiratory support requirement, or worsening fever curve in a patient that has tolerated first line therapy for 48-72 hrs.
Vaccinated patients who remain febrile after 48-72 hrs but do not have worsening respiratory symptoms, hypoxia, or worsening fever curve likely have a viral etiology and discontinuation of antibiotics should be considered



Community Acquired Pneumonia (Uncomplicated)

Inpatient

Inclusion Criteria:
Suspected uncomplicated community acquired pneumonia in patients >90 days

Exclusion Criteria:
- Complicated Pneumonia[2]
- Immunodeficiency
- Risk for aspiration
- Lung disease other than asthma
- Prior/current trach or vent dependent
- Empyema or lung abscess
- Significant cardiac anomaly
- History of Vaping
- Malignancy
- Neuromuscular Disease
- Sepsis
- Sickle Cell Disease

Targets:
- Increase Amoxicillin/ Ampicillin as 1st line ABX in all settings
- Decrease the duration of ABX to ≤ 7 days

Respiratory Viral Panel (RVP)
Routine use of respiratory viral panel is discouraged unless it will be used to change clinical management
i.e. discontinue antibiotics or diagnose pertussis

Treatment Failure
Vaccinated patients who remain febrile after 48-72 hrs but do not have worsening respiratory symptoms, hypoxia, or worsening fever curve likely have a viral etiology and discontinuation of antibiotics should be considered

[2]Complicated Pneumonia
- Opacified Hemithorax
- Moderate/ large effusion
- (>¼ of the thorax)
- Empyema
- Lung abscess
- Necrotizing pneumonia

Page 1

Inpatient Pathway Initiation
- Utilize Gen Peds Community Acquired Pneumonia Order Set
- During Flu season rapid influenza/ RSV/ SARS CoV-2 testing if not obtained in ED
- If concerns for complicated pneumonia[2] and/ or meeting PICU Evaluation Criteria, consider blood culture, otherwise not indicated
- Oxygen therapy to keep saturation >90%, refer to Oxygen Therapy Protocol. Spot check pulse oximetry if not on supplemental oxygen
- CXR (If not already performed)

Treatment
- May consider enteral antibiotic if able to tolerate PO
- Consider IV access, IV fluids, if unable to tolerate PO
- Respiratory support as needed

Immunized
Duration 7 days

1st Line:
IV: ampicillin (regardless of previous ABX use)
PO: amoxicillin

PCN Allergy
Mild Type IV (delayed maculopapular rash):
IV: ceftriaxone or clindamycin
PO: clindamycin

Type I/IgE mediated or serious delayed reactions:
IV/PO: clindamycin or levofloxacin

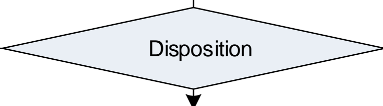
Under Immunized
(<2 doses of HiB)
Duration 7 days

1st Line:
IV: ceftriaxone or ampicillin/sulbactam
PO: amoxicillin/clavulanate

PCN Allergy
Mild Type IV (delayed maculopapular rash):
IV: ceftriaxone
PO: cefdinir

Type I/IgE mediated or serious delayed reaction:
IV/PO: levofloxacin

- Re-assess patient every 4 – 8 hours for any clinical changes
- Update patient care goals at daily rounds
- Review disposition criteria



Inpatient Discharge Criteria
- No respiratory distress
- Off supplementary Oxygen ≥ 4 hrs, including while sleeping
- Tolerating PO
- Follow up established with PCP (In person or Telehealth/ telecommunication)
- Teach back reviewed: Signs of respiratory distress, Infants with trouble breathing, dehydration, or appearing fatigue
- Instruction to contact PCP immediately with any concerning symptoms
- Refer patients with antibiotic allergy to allergy clinic for definitive testing
- Reference **Enteral Step Down Therapy** table for discharge medications

Continue Treatment
- Patients who are not improving enough to meet discharge criteria or progressing enough to meet PICU evaluation criteria should continue treatment and then be revaluated within 4-8 hours for changes

PICU Evaluation Criteria
Call a Rapid Response if patient has any of the following:
- Altered mental status
- Concern for respiratory failure or sepsis
- Hypoxemia requiring High Flow Nasal Cannula flow rates above age recommendations (see **Supporting Information** page 3) OR FiO2 of ≥ 50%
- Need for positive pressure ventilation
- Progression to, or development of complicated pneumonia

Community Acquired Pneumonia (Uncomplicated) Supporting Information

Antibiotic	Route	Dosage
Amoxicillin	PO	**Preferred for moderate to severe illness:** Three time a day regimen: 30mg/kg/dose three times daily (max 1000mg/dose) Twice a day regimen: 45mg/kg/dose twice daily (max 1500mg/dose)
Amoxicillin-clavulanate (Augmentin®)	PO	**Augmentin ES oral suspension** (amoxicillin 600mg/clavulanate 42.9mg per 5 ml) **Preferred for moderate to severe illness:** Three time a day regimen: 30mg/kg/dose of amoxicillin three times daily (max 1000mg/dose) Twice a day regimen: 45mg/kg/dose of amoxicillin twice daily (max 1800mg/dose) **Augmentin tablet (for patients weighing ≥40 kg)** Augmentin XR tab (amoxicillin 1000mg/clavulanate 62.5mg)-Not covered by Medicaid • 2000mg of amoxicillin (2 tabs) twice daily Or Augmentin 875mg tab (amoxicillin 875mg/clavulanate 125mg) • 875mg of amoxicillin (1 tab) twice daily Or Augmentin chewable tab • 800mg of amoxicillin twice daily
Ampicillin	IV	50mg/kg/dose q6h (max 2000mg/dose)
Ampicillin-sulbactam (Unasyn®)	IV	50mg/kg/dose of ampicillin q6h (max 2000mg/dose)
Azithromycin	PO	10mg/kg/dose daily (mx 500mg/dose) on day 1, followed by 5mg/kg/dose daily (max 250mg/dose) on day 2-5
Cefdinir	PO	7mg/kg/dose twice daily (max 300mg/dose)
Ceftriaxone	IV	75mg/kg/dose q24h (max 2000mg /dose)
Clindamycin	IV, PO	IV: 13mg/kg/dose q8h (max 900mg/dose) PO: 10-13mg/kg/dose three times daily (max 600mg/dose)
Levofloxacin	IV, PO	IV & PO: 6 months to <5 years: 10mg/kg/dose q12h (max 375mg/dose) IV & PO: ≥ 5 years: 10mg/kg/dose q24h (max 750mg/dose)

HFNC/HiVNI Initiation and Titration Recommendations

Note: If patient does not have increased work of breathing or hypoxemic respiratory failure (decrease in oxygen level in the blood due to respiratory failure), consider other low flow modalities prior to the initiation of HFNC/HiVNi

Age	Initiate Flow	Increase Flow by	Upper Limit of Flow/FIO2	O2 for Hypoxic Patients (<90% saturation)
0-30 days	4L/min	2L/min as WOB requires	Flow =8 LPM and/or FIO2 = 60%	Start FIO2 at 40% and increase as needed to keep oxygen saturation ≥90%
1 month- 2 years	6L/min	2L/min as WOB requires	Flow =12LPM and/or FIO2 = 60%	Start FIO2 at 40% and increase as needed to keep oxygen saturation ≥90%
3 years -6 years	8L/min	2L/min as WOB requires	Flow =14LPM and/or FIO2 = 60%	Start FIO2 at 40% and increase as needed to keep oxygen saturation ≥90%
7 years-12 years	8L/min	2L/min as WOB requires	Flow =16LPM and/or FIO2 = 60%	Start FIO2 at 40% and increase as needed to keep oxygen saturation ≥90%
13 years and up	10L/min	2L/min as WOB requires	Flow =20LPM and/or FIO2 = 60%	Start FIO2 at 40% and increase as needed to keep oxygen saturation ≥90%

* Flow may be limited by cannula or cartridge based on manufacturer's recommendations

Antibiogram	Percent of Isolates Susceptible to Tested Antibiotics			
	Penicillin (IV)[a]	Ceftriaxone	Clindamycin	Levofloxacin
Streptococcus pneumoniae				
AIDHC (2019 and 2020)[b]	99	100	88	99

[a]Ampicillin/amoxicillin activity can be inferred from penicillin result
[b]Due to low # of isolates in 2020, data from 2019 was combined with 2020 to increase the sample size

Enteral Step-Down Therapy Total (IV plus enteral) duration of therapy=7 days	
Initial IV therapy	**Enteral step down**
Ampicillin	High dose amoxicillin
Ceftriaxone (PCN allergy and immunized)	Clindamycin
Ceftriaxone (Unimmunized or failed IV ampicillin)	Amoxicillin/clavulanate
Ceftriaxone (PCN allergy and unimmunized)	Cefdinir
Clindamycin	Clindamycin
Levofloxacin	Levofloxacin

References

Seattle Children's. Community-Acquired Pneumonia v6.0: ED Phase. https://www.seattlechildrens.org/pdf/pneumonia-pathway.pdf. [modified 2020 May; cited 2020 Nov 13]

Neuman MI, Hall M, Lipsett SC, Hersh AL, Williams DJ, Gerber JS, Brogan TV, Blaschke AJ, Grijalva CG, Parikh K, Ambroggio L, Shah SS; Pediatric Research in Inpatient Settings Network. Utility of Blood Culture Among Children Hospitalized With Community-Acquired Pneumonia. *Pediatrics*. 2017 Sep;140(3):e20171013. doi: 10.1542/peds.2017-1013. PMID: 28835382 https://pediatrics.aappublications.org/content/140/3/e20171013.long

Shah SN, Bachur RG, Simel DL, Neuman MI. Does This Child Have Pneumonia?: The Rational Clinical Examination Systematic Review. *JAMA*. 2017 Aug 1;318(5):462-471. doi: 10.1001/jama.2017.9039. PMID: 28763554: https://jamanetwork.com/journals/jama/fullarticle/10.1001/jama.2017.9039

Rambaud-Althaus C, Althaus F, Genton B, D'Acremont V. Clinical features for diagnosis of pneumonia in children younger than 5 years: a systematic review and meta-analysis. Lancet Infect Dis. 2015 Apr;15(4):439-50. doi: 10.1016/S1473-3099(15)70017-4. PMID: 25769269: https://www.clinicalkey.com/#!/content/playContent/1-s2.0-S1473309915700174?returnurl=https:%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS1473309915700174%3Fshowall%3Dtrue&referrer=https:%2F%2Fpubmed.ncbi.nlm.nih.gov%2F

Williams GJ, Macaskill P, Kerr M, Fitzgerald DA, Isaacs D, Codarini M, McCaskill M, Prelog K, Craig JC. Variability and accuracy in interpretation of consolidation on chest radiography for diagnosing pneumonia in children under 5 years of age. *Pediatr Pulmonol*. 2013 Dec;48(12):1195-200. doi: 10.1002/ppul.22806. PMID: 23997040: https://onlinelibrary.wiley.com/doi/full/10.1002/ppul.22806

Bradley JS, Byington CL, Shah SS, Alverson B, Carter ER, Harrison C, Kaplan SL, Mace SE, McCracken GH Jr, Moore MR, St Peter SD, Stockwell JA, Swanson JT; Pediatric Infectious Diseases Society and the Infectious Diseases Society of America. 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 Oct;53(7):e25-76. doi: 10.1093/cid/cir531. PMID: 21880587: https://academic.oup.com/cid/article/53/7/e25/424286

Lipshaw MJ, Eckerle M, Florin TA, Crotty EJ, Lipscomb J, Jacobs J, Rattan MS, Ruddy RM, Shah SS, Ambroggio L. Antibiotic Use and Outcomes in Children in the Emergency Department With Suspected Pneumonia. Pediatrics. 2020 Apr;145(4):e20193138. doi: 10.1542/peds.2019-3138. PMID: 32179662: https://pediatrics.aappublications.org/content/145/4/e20193138.long

Adkins L, Baker AM, BourqueM, Burr K, Chara K, Clarke J, Cooper J, Graham L, Hemphill A, Hertzog J, Jones C, Miller J Nelson C, Treut M, Viteri S, Zomorrodi A. Questions Direct questions about this pathway or creation of a new ED pathway to Arezoo Zomorrodi. Bronchiolitis Pathway. [modified 2019 Nov 6; cited 2020 Nov 13]

Children's Hospital Colorado, Anschutz Medical Campus. Complicated Community Acquired Pneumonia (CAP). https://www.childrenscolorado.org/4adc85/globalassets/healthcare-professionals/clinical-pathways/complicated-community-acquired-pneumonia-clinical-pathway.pdf. [2016 Sep 27; cited 2020 Nov 13]: https://www.childrenscolorado.org/4adc85/globalassets/healthcare-professionals/clinical-pathways/complicated-community-acquired-pneumonia-clinical-pathway.pdf

Lipsett SC, Monuteaux MC, Bachur RG, Finn N, Neuman MI. Negative Chest Radiography and Risk of Pneumonia. Pediatrics. 2018 Sep;142(3):e20180236. doi: 10.1542/peds.2018-0236. PMID: 30154120: https://pediatrics.aappublications.org/content/142/3/e20180236.long

Gerber J, Metjian T, Siddharth M, Davis D, Zorc J, Kaur T, Blinman T, Bateman X, Devon EP, Keren R, Bell L, Utidjian L, Chiotos K, Hayes M. Clinical Pathway for the Evaluation/Treatment of Children with Community-Acquired Pneumonia. https://www.chop.edu/clinical-pathway/pneumonia-community-acquired-clinical-pathway. [modified 2020 Oct; cited 2020 Nov 13]: https://www.chop.edu/clinical-pathway/pneumonia-community-acquired-clinical-pathway

Mane S S, Sathe V, Pustake M V, Walhekar S, Ramakrishnan S. Efficacy of Oral Amoxicillin versus Parenteral Ceftriaxone in Treatment of Uncomplicated Community Acquired Pneumonia (CAP): A Prospective, Single Blinded, Parallel Design, Randomized Controlled Trial. Pediatr Oncall J [Internet]. 2021 Jan-Mar [cited 2021 Mar 31];18: 1-6. doi: 10.7199/ped.oncall.2021.13. Available from: https://www.pediatriconcall.com/pediatric-journal/view/fulltext-articles/1305/J/0/0/707/0

Pernica JM, Harman S, Kam AJ, Carciumaru R, Vanniyasingam T, Crawford T, Dalgleish D, Khan S, Slinger RS, Fulford M, Main C, Smieja M, Thabane L, Loeb M. Short-Course Antimicrobial Therapy for Pediatric Community-Acquired Pneumonia: The SAFER Randomized Clinical Trial. *JAMA Pediatr*. 2021 May 1;175(5):475-482. doi: 10.1001/jamapediatrics.2020.6735.
PMID: 33683325

Authors: Elysha Pifko, MD; Arezoo Zomorrodi, MD; Chalanda Jones, MD; Shannon Chan, PharmD; Craig Shapiro, MD; Yamara Coutinho, MD; Kim McMahon, MD; Aaron Chidekel, MD; Sarah Perry, MD; John Sarandria, MD; Christina Morris, MD; Tariq M Ali-Dinar, MD, Adriana Cadilla, MD

Questions about this pathway or creation of a new pathway should be directed to Elysha Pifko, MD (Elysha.Pifko@nemours.org) Emergency Medicine;

Antibiotic related questions should be directed to Craig Shapiro, MD (Craig.Shapiro@nemours.org) Infectious Disease

Legal Disclaimer: These clinical practice guidelines are based upon the opinions of staff members of Nemours/A.I. DuPont Hospital for Children. Treatment should be individualized and based upon the clinical conditions of each patient.