

Community Acquired Pneumonia (CAP)

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What is a Clinical Pathway?



An evidence-based guideline that decreases unnecessary variation and helps promote safe, effective, and consistent patient care.

Why is Pathway Necessary?



- US (2018): CAP is among the most common causes for hospitalization with an annual incidence of 15.7-22.5 hospitalizations per 100,000 children (at 124,000 hospitalizations annually)
 - 2 million outpatient visits annually
- World-wide: responsible for deaths of >800,000 children annually
- **Variability in management**
- In 2011, the Infectious Diseases Society of America (IDSA) and Pediatric Infectious Diseases Society released guidelines for CAP management in pediatrics

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

John S. Bradley,^{1,8} Carrie L. Byington,^{2,9} Samir S. Shah,^{3,8} Brian Alverson,⁴ Edward R. Carter,⁵ Christopher Harrison,⁶ Sheldon L. Kaplan,⁷ Sharon E. Mace,⁸ George H. McCracken Jr,⁹ Matthew R. Moore,¹⁰ Shawn D. St Peter,¹¹ Jana A. Stockwell,¹² and Jack T. Swanson¹³

Objectives of Pathway

- Decrease variation in antibiotic usage for CAP
- Decrease unnecessary use of broad spectrum antibiotics
- Decrease unnecessary use of azithromycin
- Decrease antibiotic usage to shortest effective duration



The pathway has undergone major changes in 2023!
Look for this gold star – it will point to the changes!

Background – Common Etiologies



<1 year olds:

- Viruses
- *Chlamydia trachomatis*

<5 years old:

- Viruses (RSV; parainfluenza, flu, adenovirus, etc.) – most common
- Bacteria (*Strep pneumoniae* – most common; Hib (for unvaccinated); *S. aureus*)

≥5 years old:

- *Strep pneumoniae* – most common
- *S. aureus*
- *Mycoplasma*, *C. pneumoniae*

Background – Definitions



The pathway now divides management for CAP into uncomplicated CAP and complicated CAP.

- **Uncomplicated CAP:**

- Includes CAP with trace/small and moderate effusions

- **Complicated CAP:**

- Free flowing pleural effusion $>1/2$ hemithorax on CXR (aka “large effusion”)
- Any sized loculated/septated effusion
- Empyema
- Abscess
- Necrotic lung
- Pneumatocele

“Under-immunized”: fewer than 2 doses of Hib vaccination

- 3rd dose of Hib vaccine only slightly increases protection
 - 1 Hib dose = 59% efficacy; 2 Hib doses = 92% efficacy;
 - 3 Hib doses = 93% efficacy

Epidemiol. Infect. 2012 Aug; 140(8): 1343–1355. Published online 2012 May 14. doi: 10.1017/S0950268812000957

PMCID: PMC3404480
PMID: 22583474

Dose-specific efficacy of *Haemophilus influenzae* type b conjugate vaccines: a systematic review and meta-analysis of controlled clinical trials

U. K. GRIFFITHS,^{1*} A. CLARK,² B. GESSNER,³ A. MINERS,² C. SANDERSON,² E. R. SEDYANINGSIH,⁴ and K. E. MULHOLLAND⁵

The Journal of Infectious Diseases


SUPPLEMENT ARTICLE

IDSIA
Infectious Diseases Society of America hivma
the medicine association 0950-2688

Hib Vaccines: Their Impact on *Haemophilus influenzae* Type b Disease

Janet R. Gilsdorf

- If *Strep pneumo* is the most common cause of CAP, why aren't we considering *Strep pneumo* vaccination rates when prescribing antibiotics?

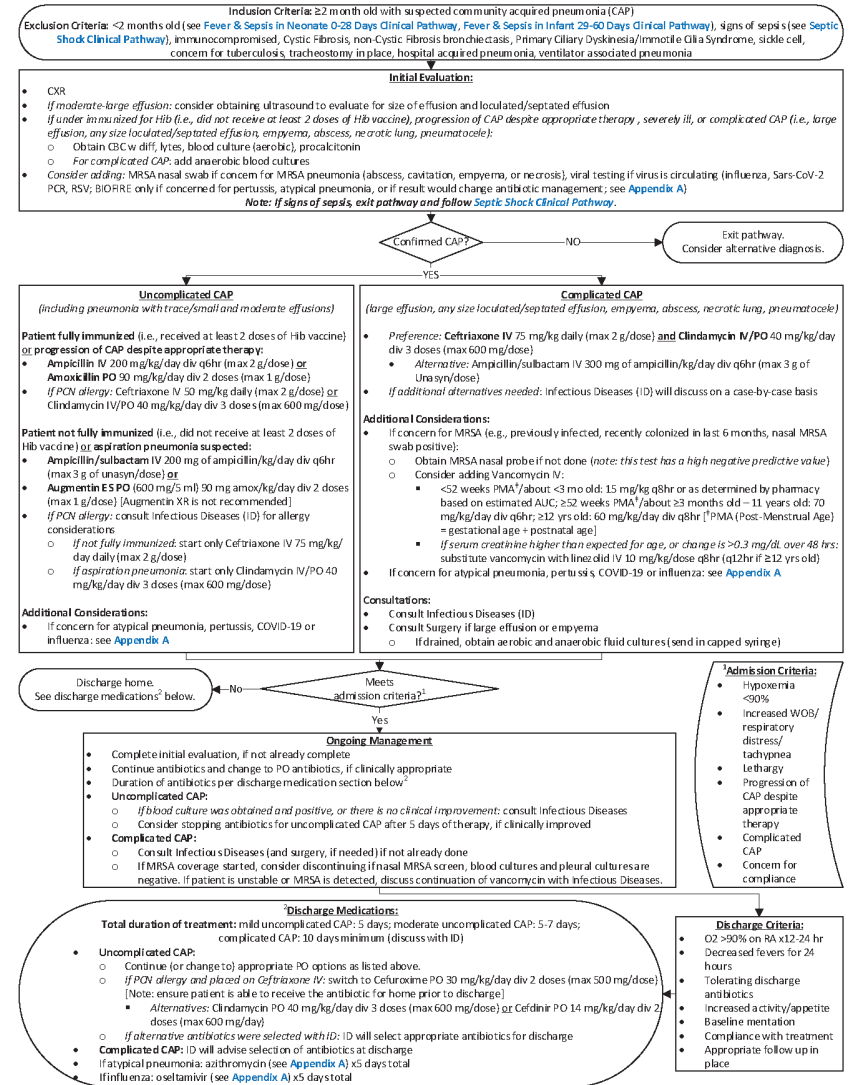
- 
- Local susceptibility data (2018 onwards) show *Strep pneumo* isolates as 98-100% susceptible to amoxicillin, with low MICs (Minimum Inhibitory Concentration)
→ no longer concerned about needing higher doses, more frequent doses, or penetration of antibiotic (for uncomplicated CAP) if *Strep pneumo* is likely etiology

“Failure of outpatient treatment”: now “progression of CAP despite appropriate therapy”

- CAP can progress at different rates while on appropriate therapy
- *Strep pneumo* can cause prolonged fevers
- “Failure” could be due to:
 - Poor adherence
 - Insufficient time on antibiotic
 - Poor antibiotic absorption
 - Drug was not penetrating well due to development of a complication of pneumonia

This is the Community Acquired Pneumonia (CAP) Clinical Pathway.

We will be reviewing each component in the following slides.



Inclusion Criteria: ≥2 month old with suspected community acquired pneumonia (CAP)

Exclusion Criteria: <2 months old (see [Fever & Sepsis in Neonate 0-28 Days Clinical Pathway](#), [Fever & Sepsis in Infant 29-60 Days Clinical Pathway](#)), signs of sepsis (see [Septic Shock Clinical Pathway](#)), immunocompromised, Cystic Fibrosis, non-Cystic Fibrosis bronchiectasis, Primary Ciliary Dyskinesia/Immotile Cilia Syndrome, sickle cell, concern for tuberculosis, tracheostomy in place, hospital acquired PNA, ventilator associated PNA

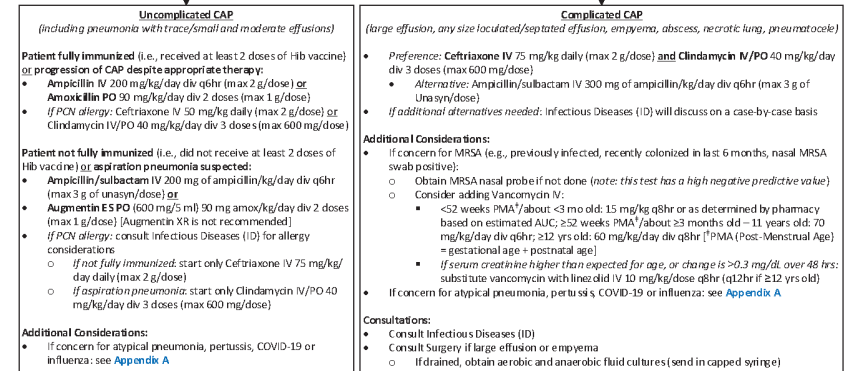
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Note: If signs of sepsis, exit pathway and follow [Septic Shock Clinical Pathway](#).

Confirmed CAP?

NO

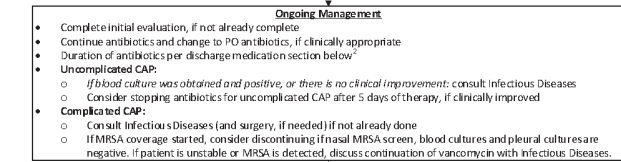
Exit pathway. Consider alternative diagnosis.



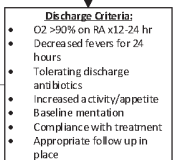
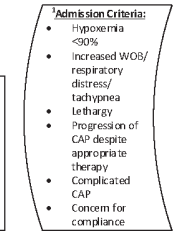
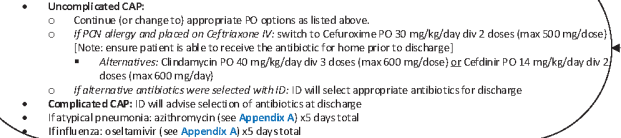
Discharge home. See discharge medications² below.

Meets admission criteria?³

Yes



Discharge Medications:
Total duration of treatment: mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 5-7 days; complicated CAP: 10 days minimum (discuss with ID)



Inclusion Criteria:

- There is no longer an upper age limit

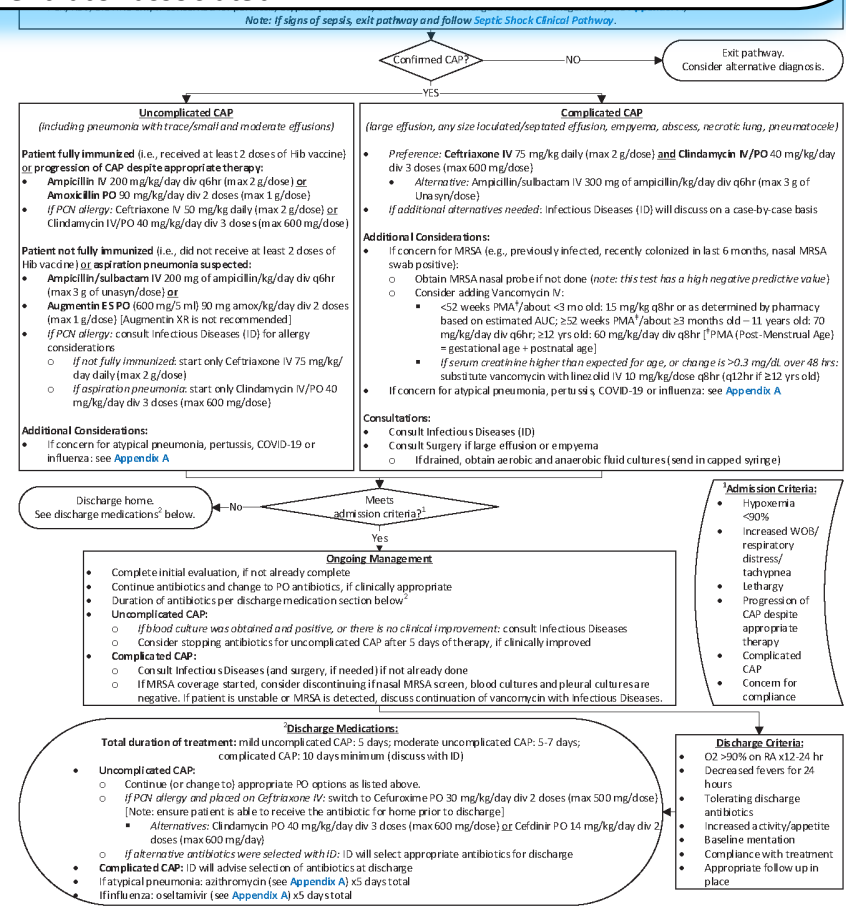
Exclusion Criteria:

- <2 month olds should be evaluated by the neonatal and infant fever pathways
- Any sign of shock will take priority and patient should be treated per the septic shock pathway
- Other exclusions may have less typical (or more resistant) organisms causing their pneumonia and should be treated off pathway

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Note:
Those with congenital heart disease, BPD, and neuromuscular diseases should now be included on this pathway as their etiology for CAP should not differ

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Initial Evaluation:

CXR

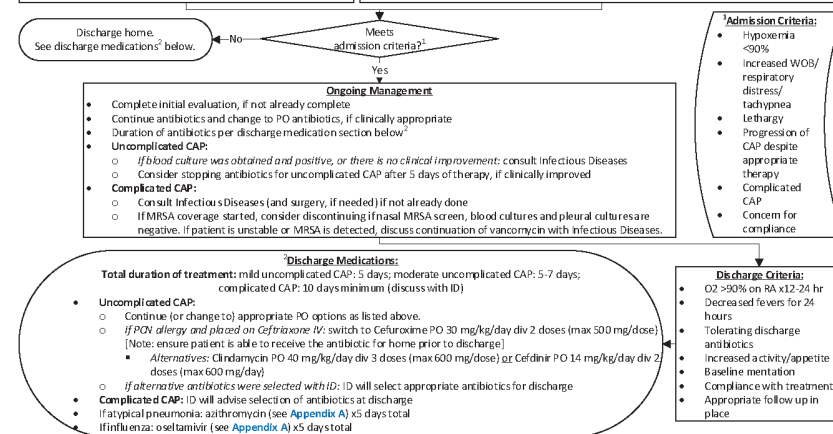
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- *If under immunized for Hib (i.e., did not receive at least 2 doses of Hib vaccine), progression of CAP despite appropriate therapy, severely ill, or complicated CAP (i.e., large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele):*
 - Obtain CBC w diff, lytes, blood culture (aerobic), procalcitonin
 - *For complicated CAP:* add anaerobic blood cultures
- *Consider adding:* MRSA nasal swab if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE only if concerned for pertussis, atypical pneumonia, or if result would change antibiotic management; see [Appendix A](#))

Note: If signs of sepsis, exit pathway and follow [Septic Shock Clinical Pathway](#).

CXR

- We recommended obtaining CXR for all children presenting to the ED with suspected CAP.
- But we recognize:
 - CXR can have low sensitivity in diagnosing CAP (particularly if uncomplicated)
 - IDSA recommends against routine CXR, particularly in outpatient settings.
 - IDSA recommends CXR in those who require admission or are more sick.

<p>Patient fully immunized (i.e., received at least 2 doses of Hib vaccine) or progression of CAP despite appropriate therapy:</p> <ul style="list-style-type: none"> • Ampicillin IV 200 mg/kg/day div q6hr (max 2 g/dose) or Amoxicillin PO 90 mg/kg/day div 2 doses (max 1 g/dose) • <i>If PCN allergy:</i> Ceftriaxone IV 50 mg/kg daily (max 2 g/dose) or Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose) 	<ul style="list-style-type: none"> • <i>Preference:</i> Ceftriaxone IV 75 mg/kg daily (max 2 g/dose) and Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose) • <i>Alternative:</i> Ampicillin/subactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasyn/dose) • <i>If additional alternatives needed:</i> Infectious Diseases (ID) will discuss on a case-by-case basis
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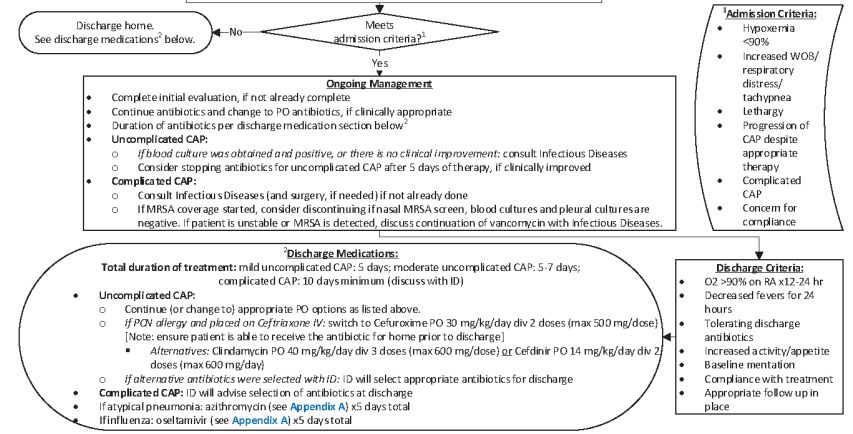
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- Consider adding: MRSA nasal swab if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE only if concerned for pertussis, atypical pneumonia, or if result would change antibiotic management; see Appendix A)
 - Note: If signs of sepsis, exit pathway and follow Septic Shock Clinical Pathway.

Lung Ultrasound

- Lung ultrasounds have better sensitivity with similar specificity to CXR
- CT Children's processes support CXR first, then ultrasound if there is a moderate-large effusion seen on CXR
- Ultrasound will help evaluate effusion size and if presence of loculated/septated effusion

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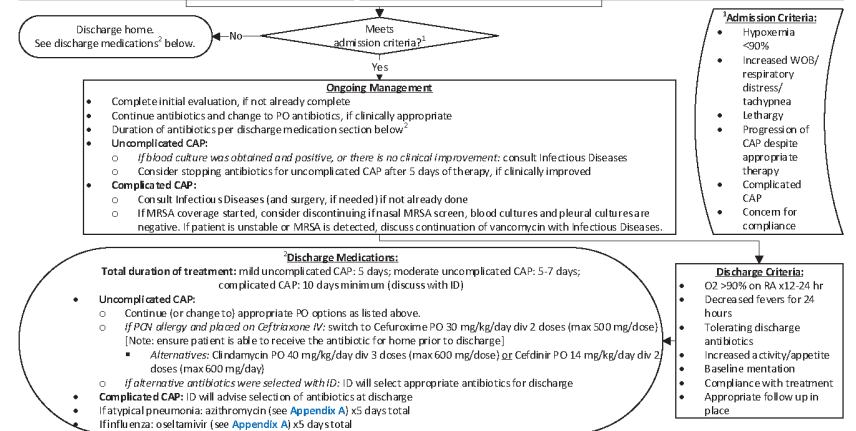
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Blood Work

- Blood work and cultures are not routinely indicated, even if the child is hospitalized
- Blood work and cultures are reserved for those who are at more risk for less common organisms, more resistant organisms, and those with complicated CAP

Be mindful of diagnostic stewardship!

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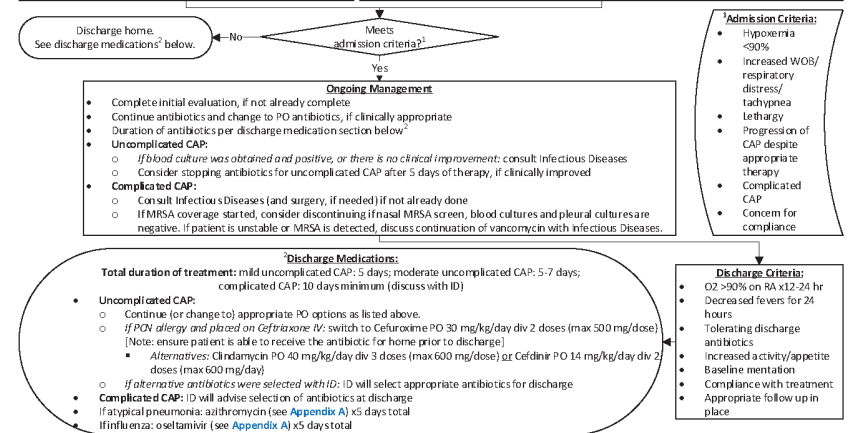
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Note: *If signs of sepsis, exit pathway and follow [Septic Shock Clinical Pathway](#).*

Blood Work

- If complicated CAP is present, anaerobic cultures should be added as patients are at more risk of having an anaerobic etiology

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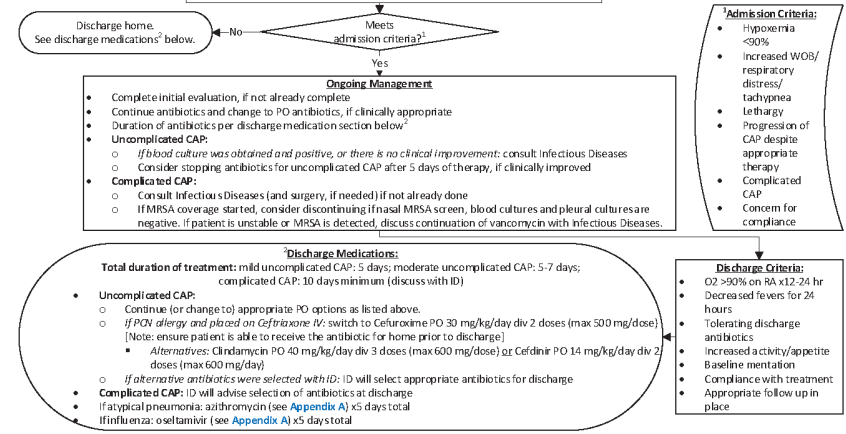
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Note: If signs of sepsis, exit pathway and follow [Septic Shock Clinical Pathway](#).

Blood Work: Procalcitonin (PCT)

- Procalcitonin rises faster, peaks sooner, decreases faster and is more specific for bacterial infections than CRP
- Procalcitonin has 30% sensitivity but 88% specificity for bacterial CAP ([high negative predictive value](#))
 - If PCT is negative/low, there is a very low likelihood that there is a bacterial CAP
- A negative PCT is far more informative than a positive one!
 - do **NOT** start or broaden antibiotics just because of an elevated PCT!

<p>Patient fully immunized (i.e., received at least 2 doses of Hib vaccine) or progression of CAP despite appropriate therapy:</p> <ul style="list-style-type: none"> • Ampicillin IV 200 mg/kg/day div q6hr (max 2 g/dose) or Amoxicillin PO 90 mg/kg/day div 2 doses (max 1 g/dose) • <i>If PCN allergy:</i> Ceftriaxone IV 50 mg/kg daily (max 2 g/dose) or Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose) 	<ul style="list-style-type: none"> • <i>Preference:</i> Ceftriaxone IV 75 mg/kg daily (max 2 g/dose) and Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose) • <i>Alternative:</i> Ampicillin/sulbactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasyn/dose) • <i>If additional alternatives needed:</i> Infectious Diseases (ID) will discuss on a case-by-case basis
<p>Patient not fully immunized (i.e., did not receive at least 2 doses of Hib vaccine) or aspiration pneumonia suspected:</p> <ul style="list-style-type: none"> • Ampicillin/sulbactam IV 200 mg of ampicillin/kg/day div q6hr (max 3 g of unasyn/dose) or Augmentin ES PO (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose) [Augmentin XR is not recommended] • <i>If PCN allergy:</i> consult Infectious Diseases (ID) for allergy considerations <ul style="list-style-type: none"> ○ <i>If not fully immunized:</i> start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose) ○ <i>If aspiration pneumonia:</i> start only Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose) 	<p>Additional Considerations:</p> <ul style="list-style-type: none"> • If concern for MRSA (e.g., previously infected, recently colonized in last 6 months, nasal MRSA swab positive): <ul style="list-style-type: none"> ○ Obtain MRSA nasal probe if not done (<i>note: this test has a high negative predictive value</i>) ○ Consider adding Vancomycin IV: <ul style="list-style-type: none"> ▪ <52 weeks PMA¹/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; ≥52 weeks PMA¹/about ≥3 months old – 11 years old: 70 mg/kg/day div q8hr; ≥12 yrs old: 60 mg/kg/day div q8hr [PMA (Post-Menstrual Age) = gestational age + postnatal age] ▪ <i>If serum creatinine higher than expected for age, or change is >0.3 mg/dL over 48 hrs:</i> substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old) • If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see Appendix A
<p>Additional Considerations:</p> <ul style="list-style-type: none"> • If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see Appendix A 	<p>Consultations:</p> <ul style="list-style-type: none"> • Consult Infectious Diseases (ID) • Consult Surgery if large effusion or empyema <ul style="list-style-type: none"> ○ If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)



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Initial Evaluation:

- CXR
- *If moderate-large effusion:* consider obtaining ultrasound to evaluate for size of effusion and loculated/septated effusion
- *If under immunized for Hib (i.e., did not receive at least 2 doses of Hib vaccine), progression of CAP despite appropriate therapy, severely ill, or complicated CAP (i.e., large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele):*
 - Obtain CBC w diff, lytes, blood culture (aerobic), procalcitonin
 - *For complicated CAP:* add anaerobic blood cultures

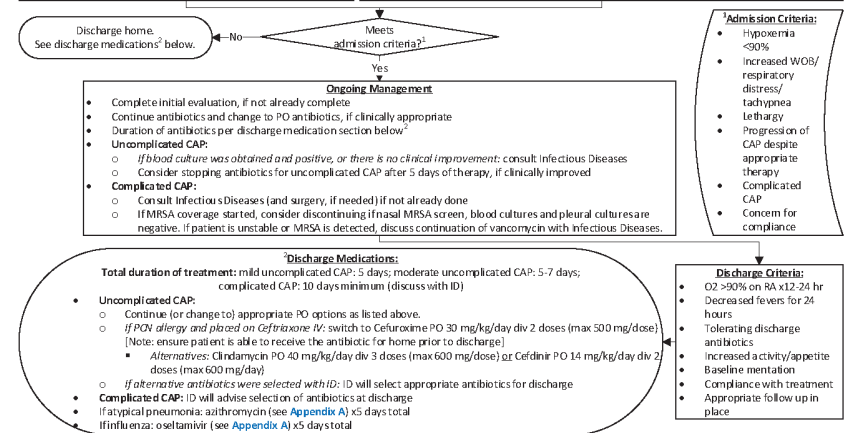
★ *Consider adding:* MRSA nasal swab if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE only if concerned for pertussis, atypical pneumonia, or if result would change antibiotic management; see [Appendix A](#))

Note: *If signs of sepsis, exit pathway and follow [Septic Shock Clinical Pathway](#).*

Additional Testing: MRSA

- MRSA testing should only be sent if concern for MRSA pneumonia (e.g., abscess, cavitation, empyema, or necrosis)
 - Do **not** send for uncomplicated CAP
- MRSA nasal swabs have a poor positive predictive value but excellent negative predictive value
 - A negative swab means you can stop MRSA coverage (if started)

<p>Patient fully immunized (i.e., received at least 2 doses of Hib vaccine) or progression of CAP despite appropriate therapy:</p> <ul style="list-style-type: none"> • Ampicillin IV 200 mg/kg/day div q6hr (max 2 g/dose) or Amoxicillin PO 90 mg/kg/day div 2 doses (max 1 g/dose) • <i>If PCN allergy:</i> Ceftriaxone IV 50 mg/kg daily (max 2 g/dose) or Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose) <p>Patient not fully immunized (i.e., did not receive at least 2 doses of Hib vaccine) or aspiration pneumonia suspected:</p> <ul style="list-style-type: none"> • Ampicillin/sulbactam IV 200 mg of ampicillin/kg/day div q6hr (max 3 g of unasn/dose) or Augmentin ES PO (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose) [Augmentin XR is not recommended] • <i>If PCN allergy:</i> consult Infectious Diseases (ID) for allergy considerations <ul style="list-style-type: none"> ○ <i>if not fully immunized:</i> start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose) ○ <i>if aspiration pneumonia:</i> start only Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose) <p>Additional Considerations:</p> <ul style="list-style-type: none"> • If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see Appendix A 	<p>Preference: Ceftriaxone IV 75 mg/kg daily (max 2 g/dose) and Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)</p> <ul style="list-style-type: none"> • Alternative: Ampicillin/sulbactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasn/dose) • <i>If additional alternatives needed:</i> Infectious Diseases (ID) will discuss on a case-by-case basis <p>Additional Considerations:</p> <ul style="list-style-type: none"> • If concern for MRSA (e.g., previously infected, recently colonized in last 6 months, nasal MRSA swab positive): <ul style="list-style-type: none"> ○ Obtain MRSA nasal probe if not done (<i>note: this test has a high negative predictive value</i>) ○ Consider adding Vancomycin IV: <ul style="list-style-type: none"> ▪ <52 weeks PMA¹/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; ≥52 weeks PMA¹/about ≥3 months old – 11 years old: 70 mg/kg/day div q8hr; ≥12 yrs old: 60 mg/kg/day div q8hr (PMA (Post-Menstrual Age) = gestational age + postnatal age) ▪ <i>if serum creatinine higher than expected for age, or change is >0.3 mg/dl over 48 hrs:</i> substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old) • If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see Appendix A <p>Consultations:</p> <ul style="list-style-type: none"> • Consult Infectious Diseases (ID) • Consult Surgery if large effusion or empyema <ul style="list-style-type: none"> ○ If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)
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Initial Evaluation:

- CXR
- *If moderate-large effusion:* consider obtaining ultrasound to evaluate for size of effusion and loculated/septated effusion
- *If under immunized for Hib (i.e., did not receive at least 2 doses of Hib vaccine), progression of CAP despite appropriate therapy, severely ill, or complicated CAP (i.e., large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele):*
 - Obtain CBC w diff, lytes, blood culture (aerobic), procalcitonin
 - *For complicated CAP:* add anaerobic blood cultures



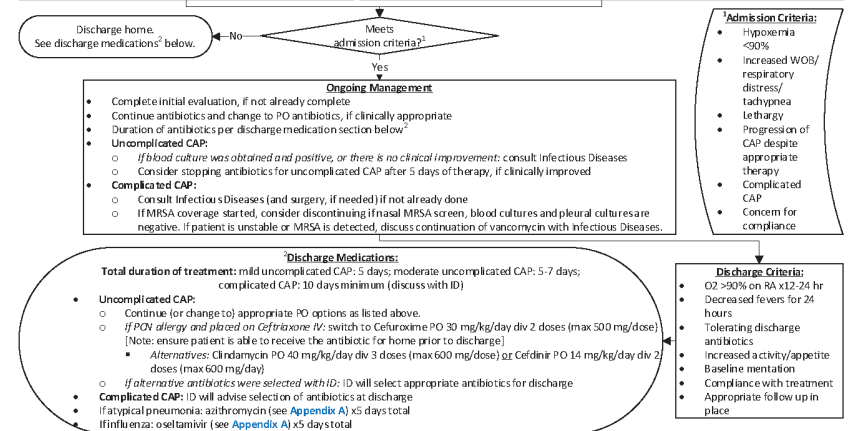
Consider adding: MRSA nasal swab if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE only if concerned for pertussis, atypical pneumonia, or if result would change antibiotic management; see [Appendix A](#))

Note: *If signs of sepsis, exit pathway and follow [Septic Shock Clinical Pathway](#).*

Additional Testing: Viral

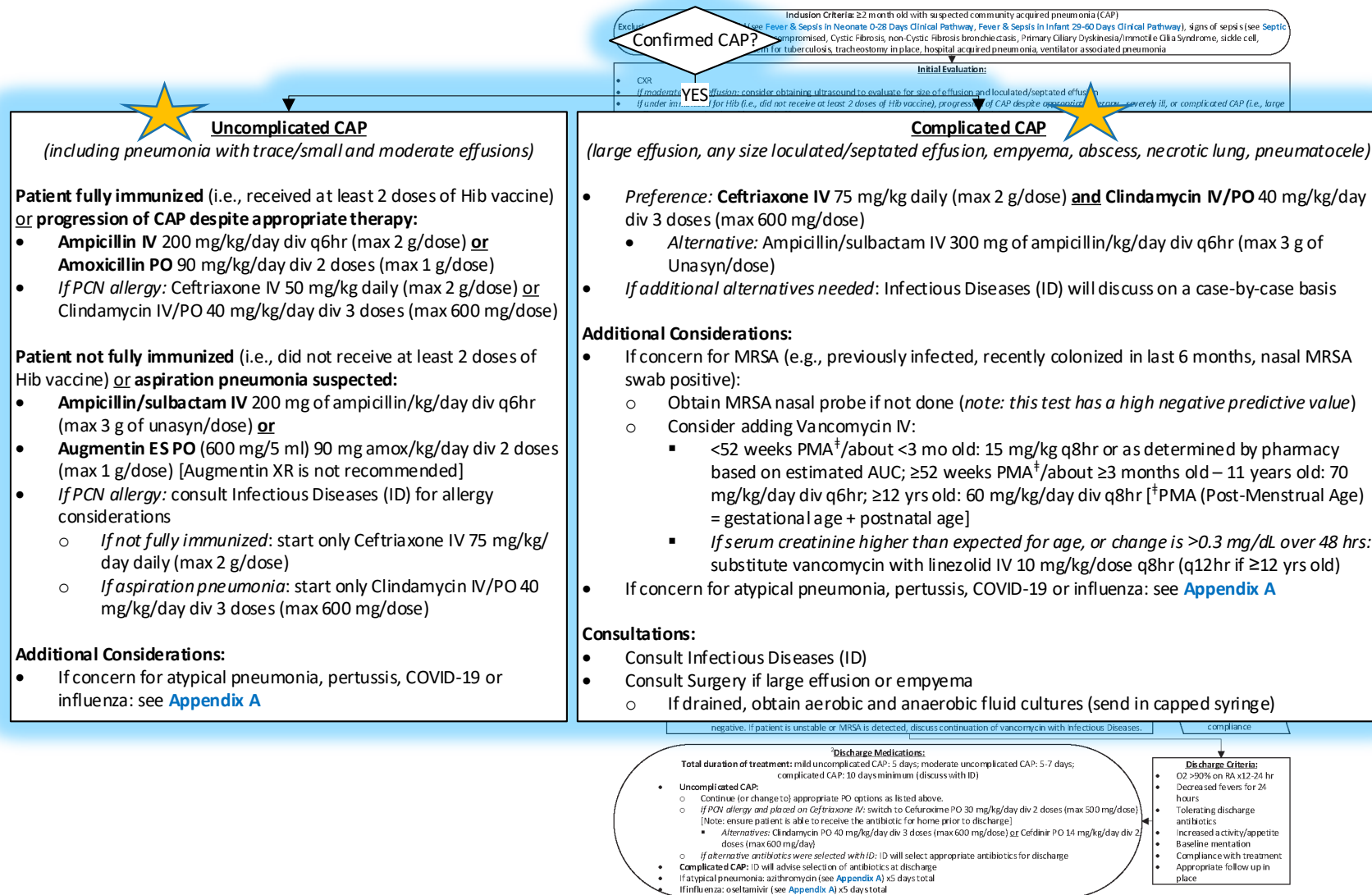
- Viral testing for influenza, Sars-CoV-2, and RSV is indicated if the virus is circulating
- Respiratory BIOFIRE should **only** be sent if there is a specific concern for pertussis, atypical pneumonia, or if the result would alter management
- Do NOT send respiratory BIOFIRE to simply obtain more information

<p>Patient fully immunized (i.e., received at least 2 doses of Hib vaccine) or progression of CAP despite appropriate therapy:</p> <ul style="list-style-type: none"> • Ampicillin IV 200 mg/kg/day div q6hr (max 2 g/dose) or Amoxicillin PO 90 mg/kg/day div 2 doses (max 1 g/dose) • <i>If PCN allergy:</i> Ceftriaxone IV 50 mg/kg daily (max 2 g/dose) or Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose) 	<ul style="list-style-type: none"> • <i>Preference:</i> Ceftriaxone IV 75 mg/kg daily (max 2 g/dose) and Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose) • <i>Alternative:</i> Ampicillin/subactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasyn/dose) • <i>If additional alternatives needed:</i> Infectious Diseases (ID) will discuss on a case-by-case basis
<p>Patient not fully immunized (i.e., did not receive at least 2 doses of Hib vaccine) or aspiration pneumonia suspected:</p> <ul style="list-style-type: none"> • Ampicillin/subactam IV 200 mg of ampicillin/kg/day div q6hr (max 3 g of unasyn/dose) or Augmentin ES PO (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose) [Augmentin XR is not recommended] • <i>If PCN allergy:</i> consult Infectious Diseases (ID) for allergy considerations <ul style="list-style-type: none"> ○ <i>If not fully immunized:</i> start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose) ○ <i>If aspiration pneumonia:</i> start only Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose) 	<p>Additional Considerations:</p> <ul style="list-style-type: none"> • If concern for MRSA (e.g., previously infected, recently colonized in last 6 months, nasal MRSA swab positive): <ul style="list-style-type: none"> ○ Obtain MRSA nasal probe if not done (<i>note: this test has a high negative predictive value</i>) ○ Consider adding Vancomycin IV: <ul style="list-style-type: none"> ▪ <52 weeks PMA¹/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; ≥52 weeks PMA¹/about ≥3 months old – 11 years old: 70 mg/kg/day div q8hr; ≥12 yrs old: 60 mg/kg/day div q8hr [PMA (Post-Menstrual Age) = gestational age + postnatal age] ▪ <i>If serum creatinine higher than expected for age, or change is >0.3 mg/dl over 48 hrs:</i> substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old) • If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see Appendix A <p>Consultations:</p> <ul style="list-style-type: none"> • Consult Infectious Diseases (ID) • Consult Surgery if large effusion or empyema <ul style="list-style-type: none"> ○ If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)
<p>Additional Considerations:</p> <ul style="list-style-type: none"> • If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see Appendix A 	



If CAP is confirmed, management will be divided by uncomplicated and complicated CAP.

- Etiology (and necessary antibiotics) depends on presence of complications of CAP rather than overall clinical severity
 → This means that a child in the PICU with an uncomplicated CAP can have their CAP managed with the same antibiotics as a child on Med/Surg floors with uncomplicated CAP.



Uncomplicated CAP

- Management is divided based on immunization status of Hib, progression of CAP, or if aspiration pneumonia is suspected

Uncomplicated CAP

(including pneumonia with trace/small and moderate effusions)

Patient fully immunized (i.e., received at least 2 doses of Hib vaccine) or **progression of CAP despite appropriate therapy:**

- **Ampicillin IV** 200 mg/kg/day div q6hr (max 2 g/dose) or **Amoxicillin PO** 90 mg/kg/day div 2 doses (max 1 g/dose)
- *If PCN allergy:* Ceftriaxone IV 50 mg/kg daily (max 2 g/dose) or Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Patient not fully immunized (i.e., did not receive at least 2 doses of Hib vaccine) or **aspiration pneumonia suspected:**

- **Ampicillin/sulbactam IV** 200 mg of ampicillin/kg/day div q6hr (max 3 g of unasyn/dose) or
- **Augmentin ES PO** (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose) [Augmentin XR is not recommended]
- *If PCN allergy:* consult Infectious Diseases (ID) for allergy considerations
 - *If not fully immunized:* start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose)
 - *If aspiration pneumonia:* start only Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Additional Considerations:

- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Uncomplicated CAP

Remember:

- If the patient received at least 2 doses of Hib vaccine, they are considered fully immunized.
- *Strep pneumo* strains are highly susceptible to amoxicillin with low MICs
- Those with progression of CAP on appropriate therapy (but still no complications of CAP present), may need more time to resolve while monitoring for complications
 - Assess fever curve (e.g., timing, how far they are spacing out) and presence of complications rather than simply broadening therapy
- We can choose a lower IV ampicillin dose q6hr **or** high dose amoxicillin divided **BID** (rather than TID)

Uncomplicated CAP

(including pneumonia with trace/small and moderate effusions)

Patient fully immunized (i.e., received at least 2 doses of Hib vaccine) **or progression of CAP despite appropriate therapy:**

- **Ampicillin IV** 200 mg/kg/day div q6hr (max 2 g/dose) **or**
Amoxicillin PO 90 mg/kg/day div 2 doses (max 1 g/dose)
- *If PCN allergy:* Ceftriaxone IV 50 mg/kg daily (max 2 g/dose) **or**
Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Patient not fully immunized (i.e., did not receive at least 2 doses of Hib vaccine) **or aspiration pneumonia suspected:**

- **Ampicillin/sulbactam IV** 200 mg of ampicillin/kg/day div q6hr (max 3 g of unasin/dose) **or**
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Additional Considerations:

- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Uncomplicated CAP

PCN Allergies:

- Perform a thorough PCN allergy history!
 - Many patients have PCN allergy noted in chart but may only have mild delayed reactions
 - Often not true allergies
- Majority of patients with PCN allergy reported can tolerate a cephalosporin
 - Third generation cephalosporins are less cross-reactive with PCN
 - Or, can choose clindamycin
- **Note:** these alternatives are not preferred. Narrowest coverage with ampicillin or amoxicillin is ideal!

Uncomplicated CAP

(including pneumonia with trace/small and moderate effusions)

Patient fully immunized (i.e., received at least 2 doses of Hib vaccine) or **progression of CAP despite appropriate therapy:**

- **Ampicillin IV** 200 mg/kg/day div q6hr (max 2 g/dose) or
Amoxicillin PO 90 mg/kg/day div 2 doses (max 1 g/dose)
If PCN allergy: Ceftriaxone IV 50 mg/kg daily (max 2 g/dose) or
Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Patient not fully immunized (i.e., did not receive at least 2 doses of Hib vaccine) or **aspiration pneumonia suspected:**

- **Ampicillin/sulbactam IV** 200 mg of ampicillin/kg/day div q6hr (max 3 g of unasin/dose) or
- **Augmentin ES PO** (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose) [Augmentin XR is not recommended]
- *If PCN allergy:* consult Infectious Diseases (ID) for allergy considerations
 - *If not fully immunized:* start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose)
 - *If aspiration pneumonia:* start only Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Additional Considerations:

- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Uncomplicated CAP

Not fully immunized for Hib:


- Need to cover Hib
- Hib produces beta lactamases → need beta lactamase inhibitors to target (e.g., clavulanate or sulbactam)
- Remember, we are no longer worried about *Strep pneumo* resistance. We don't automatically use ceftriaxone without a true PCN allergy!
- If there is a PCN allergy, consult ID to help assess if ceftriaxone is appropriate.

Uncomplicated CAP


(including pneumonia with trace/small and moderate effusions)

Patient fully immunized (i.e., received at least 2 doses of Hib vaccine) or **progression of CAP despite appropriate therapy:**

- **Ampicillin IV** 200 mg/kg/day div q6hr (max 2 g/dose) or **Amoxicillin PO** 90 mg/kg/day div 2 doses (max 1 g/dose)
- *If PCN allergy:* Ceftriaxone IV 50 mg/kg daily (max 2 g/dose) or Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

 **Patient not fully immunized** (i.e., did not receive at least 2 doses of Hib vaccine) or **aspiration pneumonia suspected:**

- **Ampicillin/sulbactam IV** 200 mg of ampicillin/kg/day div q6hr (max 3 g of unasin/dose) or
- **Augmentin ES PO** (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose) [Augmentin XR is not recommended]
- *If PCN allergy:* consult Infectious Diseases (ID) for allergy considerations

-  *If not fully immunized:* start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose)
 - *If aspiration pneumonia:* start only Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Additional Considerations:

- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Uncomplicated CAP

Aspiration Pneumonia:

- Need to cover anaerobic oral flora
- If PCN allergy is present, consult ID
 - Ceftriaxone doesn't cover anaerobes
 - Clindamycin may be a good alternative but it does not have Hib coverage

Uncomplicated CAP

(including pneumonia with trace/small and moderate effusions)

Patient fully immunized (i.e., received at least 2 doses of Hib vaccine) or **progression of CAP despite appropriate therapy:**

- **Ampicillin IV** 200 mg/kg/day div q6hr (max 2 g/dose) or **Amoxicillin PO** 90 mg/kg/day div 2 doses (max 1 g/dose)
- *If PCN allergy:* Ceftriaxone IV 50 mg/kg daily (max 2 g/dose) or Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Patient not fully immunized (i.e., did not receive at least 2 doses of Hib vaccine) or **aspiration pneumonia suspected:**

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- *If PCN allergy:* consult Infectious Diseases (ID) for allergy considerations
 - *If not fully immunized:* start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose)
 - *If aspiration pneumonia:* start only Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Additional Considerations:

- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Uncomplicated CAP

Additional Considerations:

- If there is a concern for atypical pneumonia, pertussis, COVID-19 or influenza, **Appendix A** has more detailed information.

Uncomplicated CAP

(including pneumonia with trace/small and moderate effusions)

Patient fully immunized (i.e., received at least 2 doses of Hib vaccine) or **progression of CAP despite appropriate therapy:**

- **Ampicillin IV** 200 mg/kg/day div q6hr (max 2 g/dose) or **Amoxicillin PO** 90 mg/kg/day div 2 doses (max 1 g/dose)
- *If PCN allergy:* Ceftriaxone IV 50 mg/kg daily (max 2 g/dose) or Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Patient not fully immunized (i.e., did not receive at least 2 doses of Hib vaccine) or **aspiration pneumonia suspected:**

- **Ampicillin/sulbactam IV** 200 mg of ampicillin/kg/day div q6hr (max 3 g of unasn/dose) or
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- *If PCN allergy:* consult Infectious Diseases (ID) for allergy considerations
 - *If not fully immunized:* start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose)
 - *If aspiration pneumonia:* start only Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Additional Considerations:

- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see **Appendix A**



Appendix A

<3 mo old with *Chlamydia trachomatis*

- Testing is difficult for *Chlamydia trachomatis* and ID will help navigate
- If it is proven, or strongly suspected, azithromycin therapy should be added



<3 month old with *Chlamydia trachomatis*:

- Consult Infectious Diseases (ID)
- Send diagnostic tests as directed by ID
- *If proven or strongly suspected: ADD azithromycin IV/PO 20 mg/kg x3 days*

Special Considerations:

If respiratory BIOFIRE was sent due to significant concern for atypical PNA, and resulted with a positive *Chlamydia pneumoniae*:

- **ADD** azithromycin IV/PO:
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

If respiratory BIOFIRE was sent due to significant concern for atypical PNA, and resulted with a positive *Mycoplasma pneumoniae*:

- Consider adding azithromycin (the addition of azithromycin to antibiotic regimen may have no added benefit to patient's overall clinical course)
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

Documented Influenza:

- **ADD** oseltamavir PO:
 - Preterm neonates ≤40 weeks PMA: discuss dosing with pharmacy
 - Preterm neonates >40 weeks and term neonates up to 9 months: 3 mg/kg BID
 - ≥9 months up to 12 months: 3.5 mg/kg BID
 - ≥12 months:
 - >15 kg – 23 kg: 45 mg BID
 - >23 kg – 40 kg: 60 mg BID
 - >40 kg: 75 mg BID

Suspect COVID-19:

- Place on Special Precautions
 - [ED/Inpatient COVID-19 Algorithm](#)
 - [Inpatient Therapies for COVID-19 Clinical Pathway](#)

Special Considerations:



Documented Pertussis at Any Age:

- Azithromycin IV/PO (monotherapy):
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

If respiratory BIOFIRE was sent due to significant concern for atypical PNA, and resulted with a positive *Chlamydia pneumoniae*:

- ADD azithromycin IV/PO:
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

If respiratory BIOFIRE was sent due to significant concern for atypical PNA, and resulted with a positive *Mycoplasma pneumoniae*:

- Consider adding azithromycin (the addition of azithromycin to antibiotic regimen may have no added benefit to patient's overall clinical course)
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

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- ADD oseltamavir PO:
 - Preterm neonates ≤40 weeks PMA: discuss dosing with pharmacy
 - Preterm neonates >40 weeks and term neonates up to 9 months: 3 mg/kg BID
 - ≥9 months up to 12 months: 3.5 mg/kg BID
 - ≥12 months:
 - >15 kg – 23 kg: 45 mg BID
 - >23 kg – 40 kg: 60 mg BID
 - >40 kg: 75 mg BID

Suspect COVID-19:

- Place on Special Precautions
 - [ED/Inpatient COVID-19 Algorithm](#)
 - [Inpatient Therapies for COVID-19 Clinical Pathway](#)

Appendix A

Pertussis

- If pertussis is proven, azithromycin should be used as monotherapy (e.g., discontinue other antibiotics)



If respiratory BIOFIRE was sent due to significant concern for atypical pneumonia, and resulted with a positive *Chlamydia pneumoniae*:

- **ADD** azithromycin IV/PO:
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

Appendix A

Chlamydia pneumoniae

- If respiratory BIOFIRE was sent due to a significant concern for atypical pneumonia and it resulted with a positive *Chlamydia pneumoniae*, add azithromycin
- Remember, respiratory BIOFIRE should **not** be routinely sent

- Azithromycin IV/PO (monotherapy):
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

If respiratory BIOFIRE was sent due to significant concern for atypical PNA, and resulted with a positive *Chlamydia pneumoniae*:

- **ADD** azithromycin IV/PO:
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

If respiratory BIOFIRE was sent due to significant concern for atypical PNA, and resulted with a positive *Mycoplasma pneumoniae*:

- Consider adding azithromycin (the addition of azithromycin to antibiotic regimen may have no added benefit to patient's overall clinical course)
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

Documented Influenza:

- **ADD** oseltamavir PO:
 - Preterm neonates ≤40 weeks PMA: discuss dosing with pharmacy
 - Preterm neonates >40 weeks and term neonates up to 9 months: 3 mg/kg BID
 - ≥9 months up to 12 months: 3.5 mg/kg BID
 - ≥12 months:
 - >15 kg – 23 kg: 45 mg BID
 - >23 kg – 40 kg: 60 mg BID
 - >40 kg: 75 mg BID

Suspect COVID-19:

- Place on Special Precautions
 - [ED/Inpatient COVID-19 Algorithm](#)
 - [Inpatient Therapies for COVID-19 Clinical Pathway](#)



If respiratory BIOFIRE was sent due to significant concern for atypical pneumonia, and resulted with a positive *Mycoplasma pneumoniae*:

- Consider adding azithromycin (the addition of azithromycin to antibiotic regimen may have no added benefit to patient's overall clinical course)
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

Documented Pertussis at Any Age:

- Azithromycin IV/PO (monotherapy):
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

If respiratory BIOFIRE was sent due to significant concern for atypical PNA, and resulted with a positive *Chlamydia pneumoniae*:

- **ADD** azithromycin IV/PO:
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

If respiratory BIOFIRE was sent due to significant concern for atypical PNA, and resulted with a positive *Mycoplasma pneumoniae*:

- Consider adding azithromycin (the addition of azithromycin to antibiotic regimen may have no added benefit to patient's overall clinical course)
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

Documented Influenza:

- **ADD** oseltamavir PO:
 - Preterm neonates ≤40 weeks PMA: discuss dosing with pharmacy
 - Preterm neonates >40 weeks and term neonates up to 9 months: 3 mg/kg BID
 - ≥9 months up to 12 months: 3.5 mg/kg BID
 - ≥12 months:
 - >15 kg – 23 kg: 45 mg BID
 - >23 kg – 40 kg: 60 mg BID
 - >40 kg: 75 mg BID

Suspect COVID-19:

- Place on Special Precautions
 - [ED/Inpatient COVID-19 Algorithm](#)
 - [Inpatient Therapies for COVID-19 Clinical Pathway](#)

Appendix A

Mycoplasma pneumoniae

- *Mycoplasma pneumoniae* is a common cause of CAP in older children
- Studies have shown that the addition of azithromycin has **no** significant clinical benefit for *mycoplasma*-associated uncomplicated CAP
- If respiratory BIOFIRE was sent due to a significant concern for atypical pneumonia and it resulted with a positive *Mycoplasma pneumoniae*, azithromycin does **not** have to automatically be added

Appendix A

Azithromycin

- No significant benefit for *mycoplasma*-associated uncomplicated CAP
- Resistances are emerging for *Strep pneumo*.
 - Never use as monotherapy (unless documented pertussis)

CLINICAL PATHWAY: Community Acquired Pneumonia (CAP) Appendix A: Special Considerations

THIS PATHWAY
SERVES AS A GUIDE
AND DOES NOT
REPLACE CLINICAL
JUDGMENT.

Special Considerations:

<3 month old with *Chlamydia trachomatis*:

- Consult Infectious Diseases (ID)
- Send diagnostic tests as directed by ID
- *If proven or strongly suspected: ADD* azithromycin IV/PO 20 mg/kg x3 days

Documented Pertussis at Any Age:

- Azithromycin IV/PO (monotherapy):
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

If respiratory BIOFIRE was sent due to significant concern for atypical PNA, and resulted with a positive *Chlamydia pneumoniae*:

- **ADD** azithromycin IV/PO:
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

If respiratory BIOFIRE was sent due to significant concern for atypical PNA, and resulted with a positive *Mycoplasma pneumoniae*:

- Consider adding azithromycin (the addition of azithromycin to antibiotic regimen may have no added benefit to patient's overall clinical course)
 - <6 mo old: 10 mg/kg x5 days
 - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

Documented Influenza:

- **ADD** oseltamavir PO:
 - Preterm neonates ≤40 weeks PMA: discuss dosing with pharmacy
 - Preterm neonates >40 weeks and term neonates up to 9 months: 3 mg/kg BID
 - ≥9 months up to 12 months: 3.5 mg/kg BID
 - ≥12 months:
 - >15 kg – 23 kg: 45 mg BID
 - >23 kg – 40 kg: 60 mg BID
 - >40 kg: 75 mg BID

Suspect COVID-19:

- Place on Special Precautions
 - [ED/Inpatient COVID-19 Algorithm](#)
 - [Inpatient Therapies for COVID-19 Clinical Pathway](#)

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Appendix A

Influenza

- If influenza is documented, add oseltamavir

COVID-19

- COVID screening and management are discussed on these linked pathways

CLINICAL PATHWAY: Community Acquired Pneumonia (CAP) Appendix A: Special Considerations

THIS PATHWAY
SERVES AS A GUIDE
AND DOES NOT
REPLACE CLINICAL
JUDGMENT.



Documented Influenza:

- **ADD oseltamavir PO:**
 - Preterm neonates ≤ 40 weeks PMA: discuss dosing with pharmacy
 - Preterm neonates > 40 weeks and term neonates up to 9 months: 3 mg/kg BID
 - ≥ 9 months up to 12 months: 3.5 mg/kg BID
 - ≥ 12 months:
 - > 15 kg – 23 kg: 45 mg BID
 - > 23 kg – 40 kg: 60 mg BID
 - > 40 kg: 75 mg BID
- < 6 mo old: 10 mg/kg x5 days
- ≥ 6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days



If respiratory BIOFIRE was sent due to significant concern for atypical PNA, and resulted with a positive *Mycoplasma pneumoniae*:

- Consider adding azithromycin (the addition of azithromycin to antibiotic regimen may have no added benefit to patient's overall

Suspect COVID-19:

- Place on Special Precautions
 - **ED/Inpatient COVID-19 Algorithm**
 - **Inpatient Therapies for COVID-19 Clinical Pathway**
- > 23 kg – 40 kg: 60 mg BID
- > 40 kg: 75 mg BID

Suspect COVID-19:

- Place on Special Precautions
 - **ED/Inpatient COVID-19 Algorithm**
 - **Inpatient Therapies for COVID-19 Clinical Pathway**

Complicated CAP

Complicated CAP is defined as the presence of the following:

- Large effusion
- Any size loculated/septated effusion
- Empyema
- Abscess
- Necrotic lung
- Pneumatocele

Note: it is no longer defined by the overall clinical status of the child.



Complicated CAP

(large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele)

- Preference: **Ceftriaxone IV** 75 mg/kg daily (max 2 g/dose) **and Clindamycin IV/PO** 40 mg/kg/day div 3 doses (max 600 mg/dose)
 - Alternative: Ampicillin/sulbactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasyn/dose)
- If additional alternatives needed: Infectious Diseases (ID) will discuss on a case-by-case basis

Additional Considerations:

- If concern for MRSA (e.g., previously infected, recently colonized in last 6 months, nasal MRSA swab positive):
 - Obtain MRSA nasal probe if not done (*note: this test has a high negative predictive value*)
 - Consider adding Vancomycin IV:
 - <52 weeks PMA[†]/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; ≥52 weeks PMA[†]/about ≥3 months old – 11 years old: 70 mg/kg/day div q6hr; ≥12 yrs old: 60 mg/kg/day div q8hr [[†]PMA (Post-Menstrual Age) = gestational age + postnatal age]
 - If serum creatinine higher than expected for age, or change is >0.3 mg/dL over 48 hrs: substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Consultations:

- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
 - If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)

Complicated CAP

Etiology of complicated CAP

- In addition to usual culprits, think of anaerobes (even without a clear hx of aspiration)

Coverage

- Important to cover for anaerobes even if they don't grow out in culture (they are difficult to grow!)
- American Association for Thoracic Surgery (2016) recommends anaerobic coverage for complicated CAP even if culture are negative



Complicated CAP

(large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele)

- Preference: **Ceftriaxone IV** 75 mg/kg daily (max 2 g/dose) **and Clindamycin IV/PO** 40 mg/kg/day div 3 doses (max 600 mg/dose)
 - Alternative: Ampicillin/sulbactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasyn/dose)
- If additional alternatives needed: Infectious Diseases (ID) will discuss on a case-by-case basis

Additional Considerations:

- If concern for MRSA (e.g., previously infected, recently colonized in last 6 months, nasal MRSA swab positive):
 - Obtain MRSA nasal probe if not done (*note: this test has a high negative predictive value*)
 - Consider adding Vancomycin IV:
 - <52 weeks PMA[†]/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; ≥52 weeks PMA[†]/about ≥3 months old – 11 years old: 70 mg/kg/day div q6hr; ≥12 yrs old: 60 mg/kg/day div q8hr [[†]PMA (Post-Menstrual Age) = gestational age + postnatal age]
 - If serum creatinine higher than expected for age, or change is >0.3 mg/dL over 48 hrs: substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Consultations:

- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
 - If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)

Complicated CAP

Antimicrobial Coverage

- In line with American Association for Thoracic Surgery (2016)
 - In areas with lower resistance patterns, 3rd generation cephalosporin with clindamycin for anaerobic coverage; or an antibiotic with a beta lactamase inhibitor (e.g., sulbactam)
- Ceftriaxone and ampicillin/sulbactam should be dosed **higher** than they are for uncomplicated CAP. This allows for better penetration into affected lung spaces.



Complicated CAP

(large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele)

- Preference: **Ceftriaxone IV** 75 mg/kg daily (max 2 g/dose) **and Clindamycin IV/PO** 40 mg/kg/day div 3 doses (max 600 mg/dose)
 - Alternative: Ampicillin/sulbactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasyn/dose)
- If additional alternatives needed: Infectious Diseases (ID) will discuss on a case-by-case basis

Additional Considerations:

- If concern for MRSA (e.g., previously infected, recently colonized in last 6 months, nasal MRSA swab positive):
 - Obtain MRSA nasal probe if not done (*note: this test has a high negative predictive value*)
 - Consider adding Vancomycin IV:
 - <52 weeks PMA[†]/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; ≥52 weeks PMA[†]/about ≥3 months old – 11 years old: 70 mg/kg/day div q6hr; ≥12 yrs old: 60 mg/kg/day div q8hr [[†]PMA (Post-Menstrual Age) = gestational age + postnatal age]
 - If serum creatinine higher than expected for age, or change is >0.3 mg/dL over 48 hrs: substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Consultations:

- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
 - If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)

Complicated CAP

Clinical Pearl: Pain Control

- If appropriate, consider using NSAIDs for pain control and treat pleuritis
- Persistent pleural inflammation may contribute to ongoing production of pleural fluid



Complicated CAP

(large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele)

- Preference: **Ceftriaxone IV** 75 mg/kg daily (max 2 g/dose) **and Clindamycin IV/PO** 40 mg/kg/day div 3 doses (max 600 mg/dose)
 - Alternative: Ampicillin/sulbactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasyn/dose)
- If additional alternatives needed: Infectious Diseases (ID) will discuss on a case-by-case basis

Additional Considerations:

- If concern for MRSA (e.g., previously infected, recently colonized in last 6 months, nasal MRSA swab positive):
 - Obtain MRSA nasal probe if not done (*note: this test has a high negative predictive value*)
 - Consider adding Vancomycin IV:
 - <52 weeks PMA[†]/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; ≥52 weeks PMA[†]/about ≥3 months old – 11 years old: 70 mg/kg/day div q6hr; ≥12 yrs old: 60 mg/kg/day div q8hr [[†]PMA (Post-Menstrual Age) = gestational age + postnatal age]
 - If serum creatinine higher than expected for age, or change is >0.3 mg/dL over 48 hrs: substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Consultations:

- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
 - If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)

Complicated CAP

MRSA

- MRSA is a consideration for complicated CAP, particularly if the patient was previously infected, colonized in the last 6 months, or if the MRSA swab is positive
- Consider adding vancomycin coverage
- Remember that MRSA nasal swabs have a high negative predictive value. If it is negative, it is very unlikely that MRSA is a concern and vancomycin should be discontinued



Complicated CAP

(large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele)

- Preference: **Ceftriaxone IV** 75 mg/kg daily (max 2 g/dose) **and Clindamycin IV/PO** 40 mg/kg/day div 3 doses (max 600 mg/dose)
 - Alternative: Ampicillin/sulbactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasyn/dose)
- If additional alternatives needed: Infectious Diseases (ID) will discuss on a case-by-case basis

Additional Considerations:

- If concern for MRSA (e.g., previously infected, recently colonized in last 6 months, nasal MRSA swab positive):
 - Obtain MRSA nasal probe if not done (*note: this test has a high negative predictive value*)
 - Consider adding Vancomycin IV:
 - <52 weeks PMA[†]/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; ≥52 weeks PMA[†]/about ≥3 months old – 11 years old: 70 mg/kg/day div q6hr; ≥12 yrs old: 60 mg/kg/day div q8hr [[†]PMA (Post-Menstrual Age) = gestational age + postnatal age]
 - If serum creatinine higher than expected for age, or change is >0.3 mg/dL over 48 hrs: substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Consultations:

- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
 - If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)

Complicated CAP

Clinical Pearl: AKI

- Monitor closely for acute kidney injury, particularly if the patient is on vancomycin, NSAIDs, and if they received contrast



Complicated CAP

(large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele)

- Preference: **Ceftriaxone IV** 75 mg/kg daily (max 2 g/dose) **and Clindamycin IV/PO** 40 mg/kg/day div 3 doses (max 600 mg/dose)
 - Alternative: Ampicillin/sulbactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasyn/dose)
- If additional alternatives needed: Infectious Diseases (ID) will discuss on a case-by-case basis

Additional Considerations:

- If concern for MRSA (e.g., previously infected, recently colonized in last 6 months, nasal MRSA swab positive):
 - Obtain MRSA nasal probe if not done (*note: this test has a high negative predictive value*)
 - Consider adding Vancomycin IV:
 - <52 weeks PMA[†]/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; ≥52 weeks PMA[†]/about ≥3 months old – 11 years old: 70 mg/kg/day div q6hr; ≥12 yrs old: 60 mg/kg/day div q8hr [[†]PMA (Post-Menstrual Age) = gestational age + postnatal age]
 - If serum creatinine higher than expected for age, or change is >0.3 mg/dL over 48 hrs: substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Consultations:

- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
 - If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)

Complicated CAP

Consultations

- All cases of complicated CAP should have ID involvement.
- If there is a large effusion or empyema, consult surgery.
 - **Remember to send aerobic and anaerobic fluid cultures to lab in a capped syringe if anything is drained!**

Complicated CAP

(large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele)

- Preference: **Ceftriaxone IV** 75 mg/kg daily (max 2 g/dose) **and Clindamycin IV/PO** 40 mg/kg/day div 3 doses (max 600 mg/dose)
 - Alternative: Ampicillin/sulbactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasyn/dose)
- If additional alternatives needed: Infectious Diseases (ID) will discuss on a case-by-case basis

Additional Considerations:

- If concern for MRSA (e.g., previously infected, recently colonized in last 6 months, nasal MRSA swab positive):
 - Obtain MRSA nasal probe if not done (*note: this test has a high negative predictive value*)
 - Consider adding Vancomycin IV:
 - <52 weeks PMA[†]/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; ≥52 weeks PMA[†]/about ≥3 months old – 11 years old: 70 mg/kg/day div q6hr; ≥12 yrs old: 60 mg/kg/day div q8hr [[†]PMA (Post-Menstrual Age) = gestational age + postnatal age]
 - If serum creatinine higher than expected for age, or change is >0.3 mg/dL over 48 hrs: substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

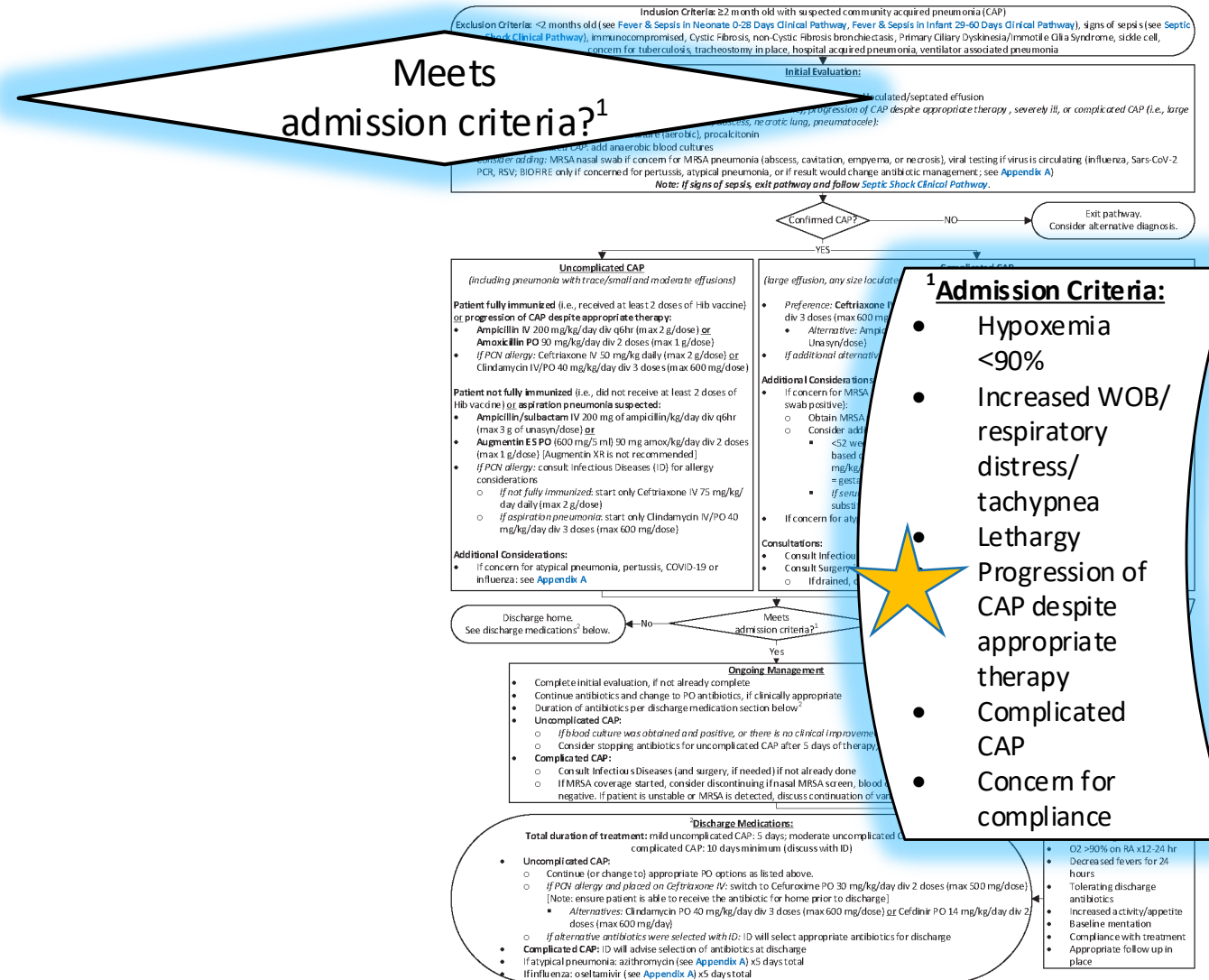
Consultations:

- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
 - If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)

Admission Criteria

Note

- All patients with progression of CAP despite appropriate therapy should be admitted so that they can be monitored for complications of CAP





Ongoing Management

- Complete initial evaluation, if not already complete
- Continue antibiotics and change to PO antibiotics, if clinically appropriate
- Duration of antibiotics per discharge medication section below²

Uncomplicated CAP:

- *If blood culture was obtained and positive, or there is no clinical improvement:* consult Infectious Diseases
- Consider stopping antibiotics for uncomplicated CAP after 5 days of therapy, if clinically improved

Complicated CAP:

- Consult Infectious Diseases (and surgery, if needed) if not already done
- If MRSA coverage started, consider discontinuing if nasal MRSA screen, blood cultures and pleural cultures are negative. If patient is unstable or MRSA is detected, discuss continuation of vancomycin with Infectious Diseases.

Ongoing Management

Uncomplicated CAP

- If blood cultures were obtained and were positive, or if there is no clinical improvement despite appropriate therapy, ID should be consulted to help tailor antimicrobial coverage
- However, if the patient is clinically improved, consider stopping antibiotics after 5 days of therapy (duration is discussed further in discharge slides)

Remember that blood cultures are not routinely indicated, even for hospitalized patients.

Blood cultures are reserved for those who are at more risk for less common organisms, more resistant organisms, and those with complicated CAP

(max 3 g of unasyn/dose) or
 • Augmentin ES PO (600 mg/5 mL) 50 mg amox/kg/day div 2 doses (max 1 g/dose) [Augmentin XR is not recommended]
 • If PCN allergy: consult Infectious Diseases (ID) for allergy considerations
 ○ If not fully immunized: start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose)
 ○ If aspiration pneumonia: start only Clindamycin 300 mg/kg/day div 3 doses (max 600 mg/dose)
 ○ Consider adding Vancomycin IV:
 • <52 weeks PMA⁷/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; >52 weeks PMA⁷/about ≥3 months old – 11 years old: 70 mg/kg/day div q8hr (PMA (Post-Menstrual Age)
 • ≥12 yrs old: 15 mg/kg/day div q8hr (q12hr if ≥12 yrs old)
 Appendix A
 Additional Considerations:
 • If concern for atypical pneumonia, see Appendix A
 • If influenza: see Appendix A
 Discharge home:
 • Change medications:
 • Complicated CAP
 • Uncomplicated CAP
 • If atypical pneumonia
 • If influenza: osetamivir
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Ongoing Management

- Complete initial evaluation, if not already complete
- Continue antibiotics and change to PO antibiotics, if clinically appropriate
- Duration of antibiotics per discharge medication section below²
- **Uncomplicated CAP:**
 - *If blood culture was obtained and positive, or there is no clinical improvement:* consult Infectious Diseases
 - Consider stopping antibiotics for uncomplicated CAP after 5 days of therapy, if clinically improved
- **Complicated CAP:**
 - Consult Infectious Diseases (and surgery, if needed) if not already done
 - If MRSA coverage started, consider discontinuing if nasal MRSA screen, blood cultures and pleural cultures are negative. If patient is unstable or MRSA is detected, discuss continuation of vancomycin with Infectious Diseases.



Ongoing Management

Complicated CAP

- Remember to consider stopping MRSA coverage if the nasal screen is negative (high negative predictive value!), particularly if blood and pleural cultures are also negative.
- If the patient is clinically unstable, or MRSA is detected, discuss MRSA coverage with ID.

Considerations:

- Augmentin ES PO (600 mg/5 ml) 50 mg amox/kg/day div 2 doses (max 1 g/dose) [Augmentin XR is not recommended]
- *PCN allergy:* consult Infectious Diseases (ID) for allergy considerations
- *Not fully immunized:* start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose)
- *Respiratory pneumonia:* start only Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Considerations:

- Consider adding Vancomycin IV:
 - <52 weeks PMA⁷/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; >52 weeks PMA⁷/about ≥3 months old - 11 years old: 70 mg/kg/day div q8hr; ≥12 yrs old: 60 mg/kg/day div q8hr (PMA (Post-Menstrual Age) = gestational age + postnatal age)
 - *If serum creatinine higher than expected for age, or change is >0.3 mg/dl over 48 hrs:* substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see Appendix A

Consultations:

- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
 - If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)

Admission Criteria:

- Hypoxemia <90%
- Increased WOB/ respiratory distress/ tachypnea
- Lethargy
- Progression of CAP despite appropriate therapy
- Complicated CAP
- Concern for compliance

Discharge Medications:

Total duration of treatment: mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 5-7 days; complicated CAP: 10 days minimum (discuss with ID)

Uncomplicated CAP:

- Continue (or change to) appropriate PO options as listed above.
- *If PCN allergy and blood on Ceftriaxone IV:* switch to Cefuroxime PO 30 mg/kg/day div 2 doses (max 500 mg/dose)
- [Note: ensure patient is able to receive the antibiotic for home prior to discharge]
 - Alternatives: Clindamycin PO 40 mg/kg/day div 3 doses (max 600 mg/dose) or Cefdinir PO 14 mg/kg/day div 2 doses (max 600 mg/day)
- *If alternative antibiotics were selected with ID:* ID will select appropriate antibiotics for discharge

Complicated CAP: ID will advise selection of antibiotics at discharge

- If atypical pneumonia: azithromycin (see Appendix A) x5 days total
- If influenza: oseltamivir (see Appendix A) x5 days total

Ongoing Management

- Complete initial evaluation, if not already complete
- Continue antibiotics and change to PO antibiotics, if clinically appropriate
- Duration of antibiotics per discharge medication section below²
- **Uncomplicated CAP:**
 - *If blood culture was obtained and positive, or there is no clinical improvement: consult Infectious Diseases*
 - Consider stopping antibiotics for uncomplicated CAP after 5 days of therapy, if clinically improved
- **Complicated CAP:**
 - Consult Infectious Diseases (and surgery, if needed) if not already done
 - If MRSA coverage started, consider discontinuing if nasal MRSA screen, blood cultures and pleural cultures are negative. If patient is unstable or MRSA is detected, discuss continuation of vancomycin with Infectious Diseases.



Ongoing Management

Note

- When trending inflammatory markers (PCT or CRP), pay close attention to units.
 - Need to only follow one inflammatory marker. Following both is redundant and considered low value care.
- Trends of CRP may be useful when assessing the rate of decrease (rather than the absolute value)
- It may help determine when PO antibiotics may be indicated

Considerations:

- Augmentin ES PO (600 mg/5 ml) 50 mg amox/kg/day div 2 doses (max 1 g/dose) [Augmentin XR is not recommended]
- *PCN allergy: consult Infectious Diseases (ID) for allergy considerations*
- *Not fully immunized: start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose)*
- *Respiratory pneumonia: start only Clindamycin IV/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)*

Considerations:

- Consider adding Vancomycin IV:
 - <52 weeks PMA⁷/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; >52 weeks PMA⁷/about ≥3 months old - 11 years old: 70 mg/kg/day div q8hr; ≥12 yrs old: 60 mg/kg/day div q8hr (PMA (Post-Menstrual Age) = gestational age + postnatal age)
 - *If serum creatinine higher than expected for age, or change is >0.3 mg/dL over 48 hrs: substitute vancomycin with linezolid IV 10 mg/kg/dose q8hr (q12hr if ≥12 yrs old)*
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see Appendix A

Consultations:

- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
 - If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)

Admission Criteria:

- Hypoxemia <90%
- Increased WOB/respiratory distress/tachypnea
- Lethargy
- Progression of CAP despite appropriate therapy
- Complicated CAP
- Concern for compliance

Discharge Medications:

Total duration of treatment: mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 5-7 days; complicated CAP: 10 days minimum (discuss with ID)

Uncomplicated CAP:

- Continue (or change to) appropriate PO options as listed above.
- *If PCN allergy and placed on Ceftriaxone IV: switch to Cefuroxime PO 30 mg/kg/day div 2 doses (max 500 mg/dose)*
- [Note: ensure patient is able to receive the antibiotic for home prior to discharge]
 - Alternatives: Clindamycin PO 40 mg/kg/day div 3 doses (max 600 mg/dose) or Cefdinir PO 14 mg/kg/day div 2 doses (max 600 mg/day)
- *If alternative antibiotics were selected with ID: ID will select appropriate antibiotics for discharge*

Complicated CAP: ID will advise selection of antibiotics at discharge

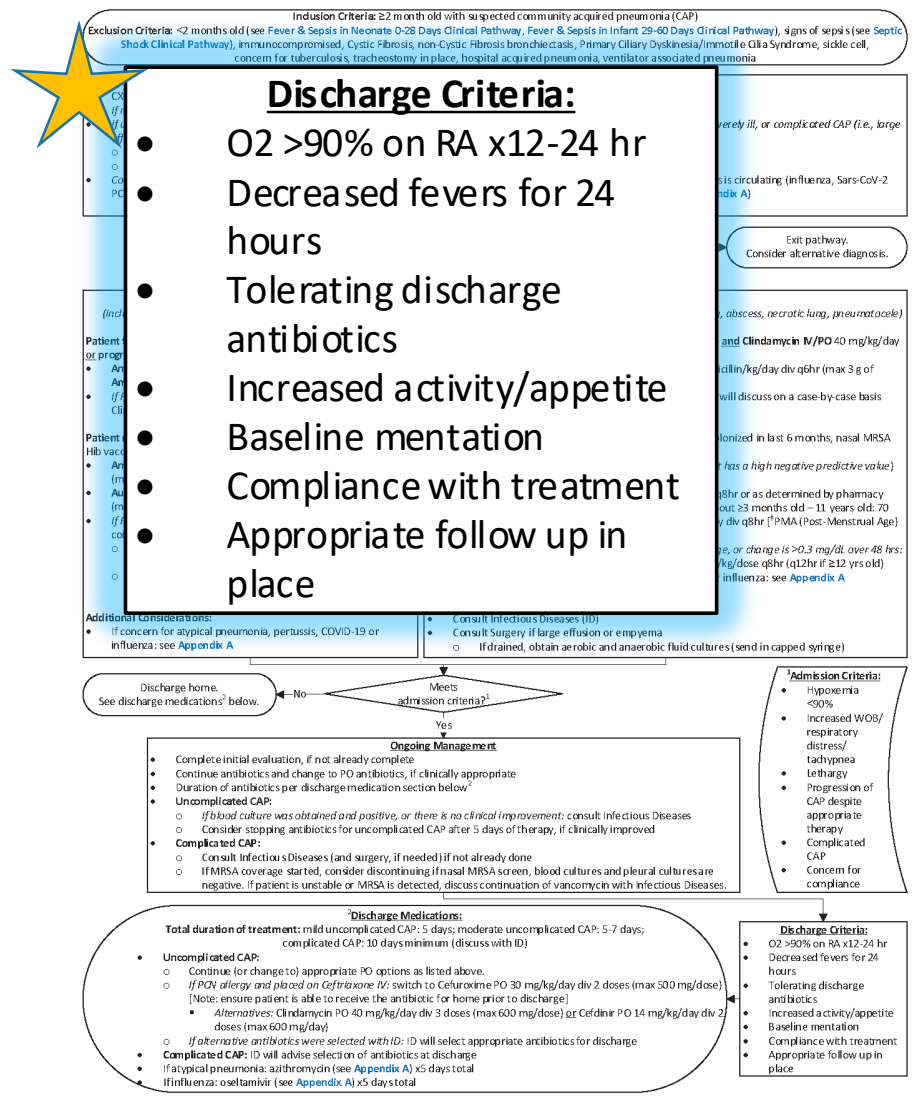
If atypical pneumonia: azithromycin (see Appendix A) x5 days total

If influenza: oseltamivir (see Appendix A) x5 days total

CLINICAL PATHWAY:
Community Acquired Pneumonia (CAP)

Discharge Criteria

- Discharge criteria are listed



²Discharge Medications:



Total duration of treatment: mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 5-7 days; complicated CAP: 10 days minimum (discuss with ID)

- **Uncomplicated CAP:**
 - Continue (or change to) appropriate PO options as listed above.
 - *If PCN allergy and placed on Ceftriaxone IV:* switch to Cefuroxime PO 30 mg/kg/day div 2 doses (max 500 mg/dose) [Note: ensure patient is able to receive the antibiotic for home prior to discharge]
 - *Alternatives:* Clindamycin PO 40 mg/kg/day div 3 doses (max 600 mg/dose) or Cefdinir PO 14 mg/kg/day div 2 doses (max 600 mg/day)
 - *If alternative antibiotics were selected with ID:* ID will select appropriate antibiotics for discharge
- **Complicated CAP:** ID will advise selection of antibiotics at discharge
- If atypical pneumonia: azithromycin (see [Appendix A](#)) x5 days total
- If influenza: oseltamivir (see [Appendix A](#)) x5 days total

Discharge Instructions

Duration of treatment

- Studies support shorter courses of antibiotics, particularly for uncomplicated CAP
 - Does not increase the odds of 30 day treatment failure
 - Avoids potential side effects with longer durations of therapy
- Mild uncomplicated CAP should be treated with the shortest duration of therapy – 5 days
- Moderate uncomplicated CAP can be extended to 5-7 days
- Complicated CAP should be treated for a minimum of 10 days with ID monitoring (inpatient and/or outpatient)

2 Discharge Medications:

Total duration of treatment: mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 5-7 days; complicated CAP: 10 days minimum (discuss with ID)



Uncomplicated CAP:

- Continue (or change to) appropriate PO options as listed above.
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- **Complicated CAP:** ID will advise selection of antibiotics at discharge
- If atypical pneumonia: azithromycin (see [Appendix A](#)) x5 days total
- If influenza: oseltamivir (see [Appendix A](#)) x5 days total

Discharge Instructions

Uncomplicated CAP antibiotics

- Amoxicillin is the best and optimal coverage for *Strep pneumo*
 - Per IDSA: no oral cephalosporins provided activity at the site of infection that equaled high dose amoxicillin
 - Most 2nd and 3rd generation cephalosporins only provide adequate activity against 60-70% of the currently isolated strains of pneumococcus
- If the patient had a **true** PCN allergy and was improving on ceftriaxone, can be placed on cefuroxime (or clindamycin or cefdinir)
 - Ceforuxime suspension must be compounded and is difficult to find. Make sure they can pick it up!

way), signs of sepsis (see Septic
a Syndrome, sickle cell,

Uncomplicated CAP (i.e., large

Influenza, Sars-CoV-2

the pathway,
Alternative diagnosis.

erotic; lung, pneumothorax)

amycin IV/PO 40 mg/kg/day

g/day div q6hr (max 3 g of

discuss on a case-by-case basis

ly colonized in last 6 months, nasal MRSA

(note: this test has a high negative predictive value)

about: <3 mo old: 15 mg/kg q8hr or as determined by pharmacy
under on estimated AUC; >52 weeks PMA /about ≥3 months old – 11 years old: 70
mg/kg/day div q8hr; >12 years old: 60 mg/kg/day div q8hr (PMA (Post-Menstrual Age)

change is >0.3 mg/dL over 48 hrs:
q8hr (q12hr if ≥12 yrs old)
see Appendix A

ed syringe)

Admission Criteria:
Hypoxemia
<90%
increased WOB/
respiratory
distress/
tachypnea
Lethargy
Progression of
CAP despite
appropriate
therapy
Complicated
CAP
Concern for
compliance

Discharge Criteria:
90% on RA x12-24 hr
based fevers for 24
hrs
Stable
Following discharge
criteria
based activity/appetite
line mentation
compliance with treatment
appropriate follow up in

2 Discharge Medications:

Total duration of treatment: mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 5-7 days; complicated CAP: 10 days minimum (discuss with ID)

- **Uncomplicated CAP:**
 - Continue (or change to) appropriate PO options as listed above.
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- **Complicated CAP:** ID will advise selection of antibiotics at discharge
- If atypical pneumonia: azithromycin (see [Appendix A](#)) x5 days total
- If influenza: oseltamivir (see [Appendix A](#)) x5 days total



• If PCN allergy: consult Infectious Diseases (ID) for allergy considerations

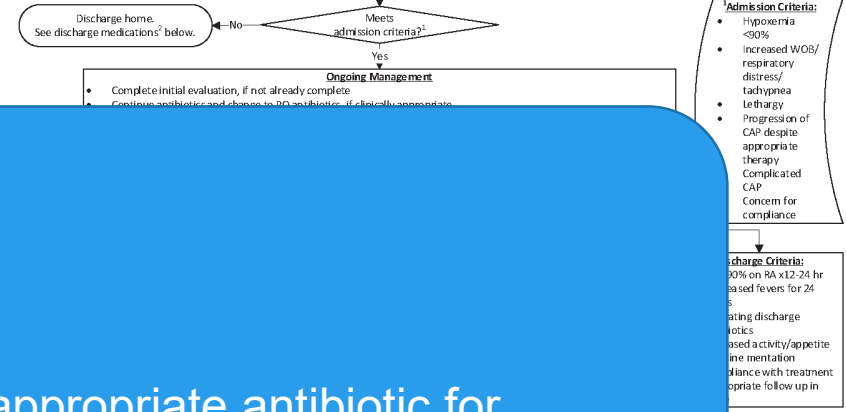
- If not fully immunized: start only Ceftriaxone IV 75 mg/kg/day daily (max 2 g/dose)
- If aspiration pneumonia: start only Clindamycin I/PO 40 mg/kg/day div 3 doses (max 600 mg/dose)

Additional Considerations:

- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see [Appendix A](#)

Consultations:

- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
 - If drained, obtain aerobic and anaerobic fluid cultures (send in capped syringe)



Discharge Instructions

Uncomplicated CAP antibiotics

- If alternative antibiotics were chosen by ID, ID will select the appropriate antibiotic for discharge

2 Discharge Medications:

Total duration of treatment: mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 5-7 days; complicated CAP: 10 days minimum (discuss with ID)

- **Uncomplicated CAP:**

- Continue (or change to) appropriate PO options as listed above.
- *If PCN allergy and placed on Ceftriaxone IV:* switch to Cefuroxime PO 30 mg/kg/day div 2 doses (max 500 mg/dose) [Note: ensure patient is able to receive the antibiotic for home prior to discharge]
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- *If alternative antibiotics were selected with ID:* ID will select appropriate antibiotics for discharge



- **Complicated CAP:** ID will advise selection of antibiotics at discharge

- If atypical pneumonia: azithromycin (see [Appendix A](#)) x5 days total
- If influenza: oseltamivir (see [Appendix A](#)) x5 days total

Discharge Instructions

Complicated CAP antibiotics

- ID should be involved in all complicated CAP patients and will determine the best selection of antibiotics at the time of discharge
- ID will continue to follow as an outpatient, as appropriate

way), signs of sepsis (see Septic Syndrome, sickle cell,

Complicated CAP (i.e., large

Fluenza, Sars-CoV-2

pathway, alternative diagnosis.

erotic; lung, pneumococle)

amycin IV/PO 40 mg/kg/day

g/day div q6hr (max 3 g of

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change is >0.3 mg/dl over 48 hrs:
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Admission Criteria:
 Hypoxemia
 <90%
 increased WOB/
 respiratory
 distress/
 tachypnea
 Lethargy
 Progression of
 CAP despite
 appropriate
 therapy
 Complicated
 CAP
 Concern for
 compliance

Discharge Criteria:
 <90% on RA x12-24 hr
 based fevers for 24
 hrs
 pending discharge
 orders
 based a ctivity/appetite
 improvement
 compliance with treatment
 appropriate follow up in

Review of Key Points

- *Strep pneumo* is very susceptible to amoxicillin
 - Ampicillin/amoxicillin is the drug of choice
 - Immunization status evaluation should focus on Hib doses
- PCN allergy should be further evaluated
- Azithromycin has no proven benefit for mycoplasma-associated uncomplicated CAP
- MRSA nasal probe and procalcitonin → high negative predictive values
- Treatment should depend on complications of CAP rather than severity of clinical illness alone
- Complicated CAP should have additional anaerobic coverage
- Courses of antibiotics should be shorter

Quality Metrics



- % of patients with CAP pathway order set
- % of patients with appropriate inpatient antibiotic selection per pathway
- % of patients with appropriate inpatient antibiotic dosage per pathway
- % of patients who receive amoxicillin/ampicillin while in the Emergency Department
- % of appropriate discharge antibiotic selection per pathway
- Average number of days (duration) of antibiotic coverage
- % of patients with nasal MRSA PCR negative and vancomycin or linezolid discontinued within 24 hours of negative PCR
- ALOS (days)

Pathway Contacts



- Grace Hong, APRN
 - CT Children's Infectious Diseases and Immunology
- Ian Michelow, MD
 - CT Children's Infectious Diseases and Immunology
- Ilana Waynik, MD
 - CT Children's Pediatric Hospital Division
- Jennifer Giroto, PharmD
 - Antimicrobial Stewardship

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Thank You!



About Connecticut Children's Pathways Program

Clinical pathways guide the management of patients to optimize consistent use of evidence-based practice. Clinical pathways have been shown to improve guideline adherence and quality outcomes, while decreasing length of stay and cost. Here at Connecticut Children's, our Clinical Pathways Program aims to deliver evidence-based, high value care to the greatest number of children in a diversity of patient settings.

These pathways serve as a guide for providers and do not replace clinical judgment.