# Community Acquired Pneumonia (CAP)

Grace Hong, APRN
Ian Michelow, MD
Ilana Waynik, MD

Connecticut Children's

# 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?

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,a] Carrie L. Byington,[2,a] Samir S. Shah,[3,a] 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. Swanson[13]

- 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
- Word-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

# Objectives of Pathway

- Decrease variation in antibiotic usage for CAP
- Decrease unnecessary use of broad spectrum antibiotics
- Optimize ampicillin/amoxicillin dosing for local pneumococcal resistance
- Decrease unnecessary use of azithromycin
- Decrease antibiotic usage to shortest effective duration

# 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

- **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

# Background – Definitions

## "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
- 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

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. MULHOLLAND[5]

The Journal of Infectious Diseases
SUPPLEMENT ARTICLE

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

Janet R. Gilsdorf

# Background – Definitions

**“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

# 2025 Clinical Pathway Updates Summary

- Added link to Penicillin Allergy Delabeling Clinical Pathway, as ampicillin/amoxicillin provides best coverage for treatment of CAP
- Added tablet option for Augmentin (if that is preferred)
- Clarified MRSA testing and timing
- Ceftriaxone, vancomycin, and linezolid dosing updated
- Consideration of scheduling NSAIDS to help with pleural fluid production in complicated CAP
- New recommendations for aspiration pneumonia
- For complicated CAP, new recommendation to NOT transition to PO antibiotics until CRP reduced by at least 50%

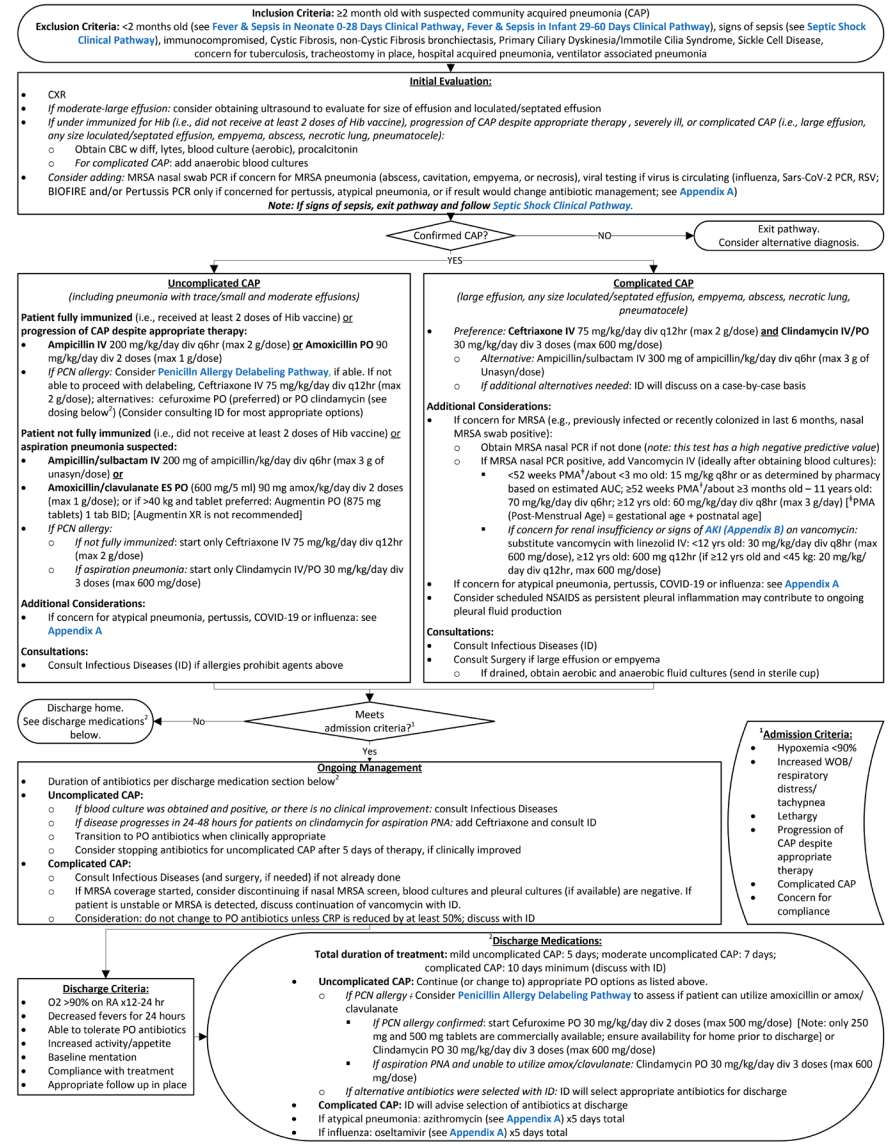
This is the Community Acquired Pneumonia (CAP) Clinical Pathway.

We will be reviewing each component in the following slides.

*CLINICAL PATHWAY:*

# Community Acquired Pneumonia (CAP)

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




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

*CLINICAL PATHWAY:*

# Community Acquired Pneumonia (CAP)

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

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

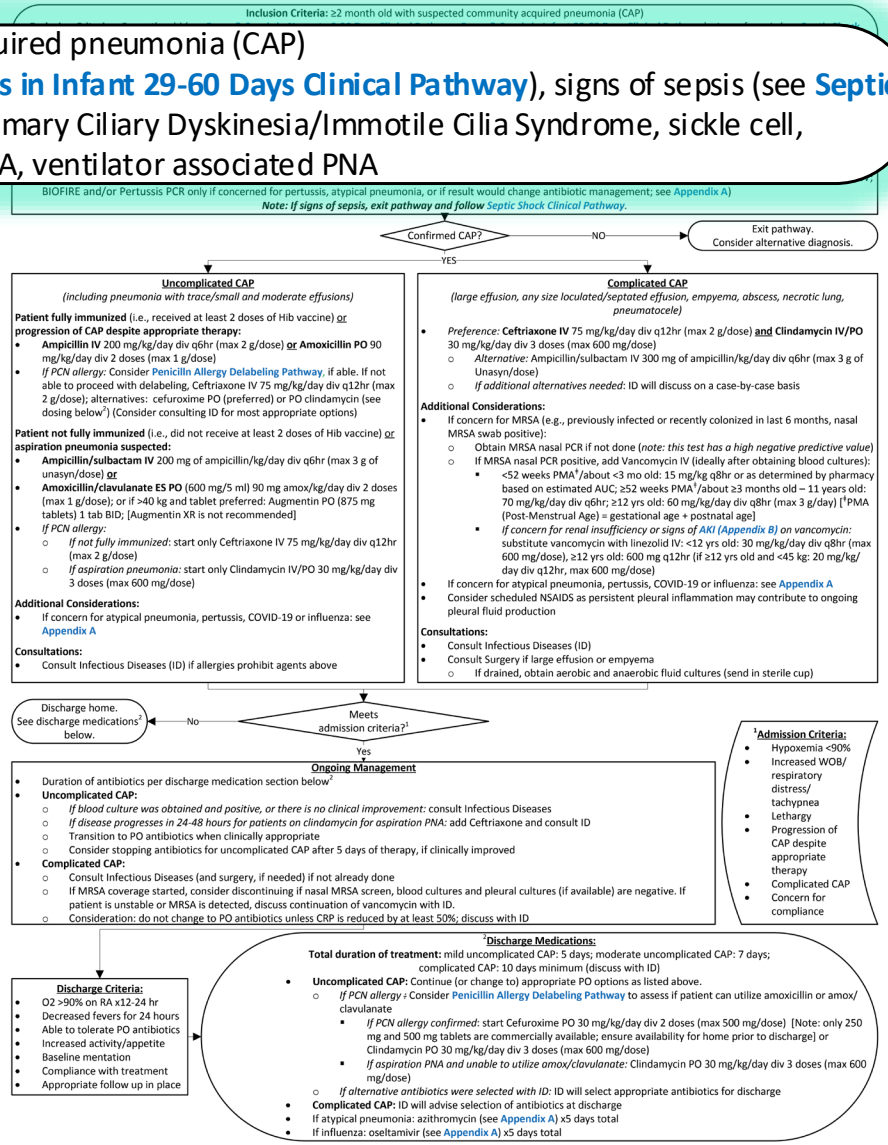
**Exclusion Criteria:** <2 months old (see **Fever & Sepsis in Neonate 0-28 Days Clinical Pathway**, **Fever & Sepsis in Infant 29-60 Days Clinical Pathway**), signs of sepsis (see **Septic Shock Clinical Pathway**), immunocompromised, Cystic Fibrosis, non-Cystic Fibrosis bronchiectasis, Primary Ciliary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

## 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




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

*CLINICAL PATHWAY:*

# Community Acquired Pneumonia (CAP)

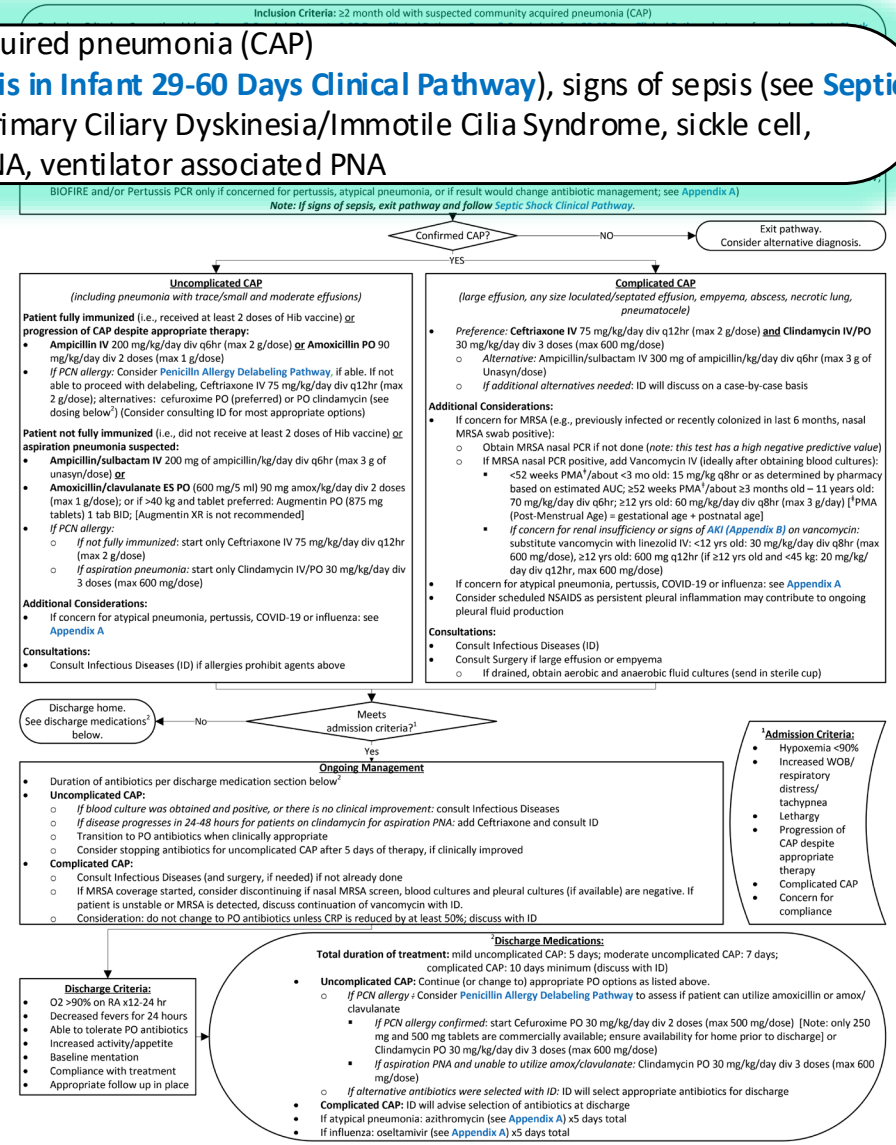
THIS PATHWAY SERVES AS A GUIDE AND DOES NOT REPLACE CLINICAL JUDGMENT.

**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

## Note:

Those with congenital heart disease, BPD, and neuromuscular diseases are **included** on this pathway as their etiology for CAP should not differ




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

*CLINICAL PATHWAY:*

# Community Acquired Pneumonia (CAP)

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

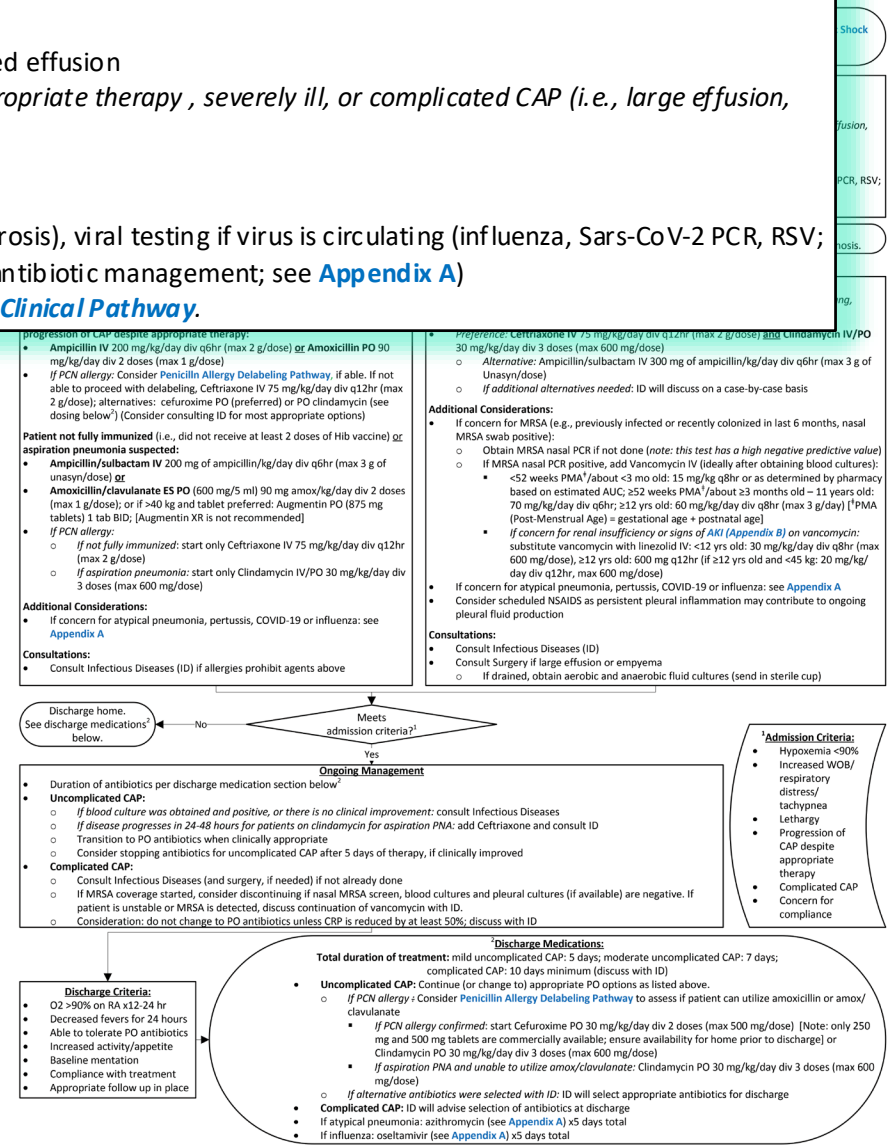
**Initial Evaluation:**

- 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 PCR if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE and/or Pertussis PCR 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.




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

*CLINICAL PATHWAY:*

# Community Acquired Pneumonia (CAP)

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

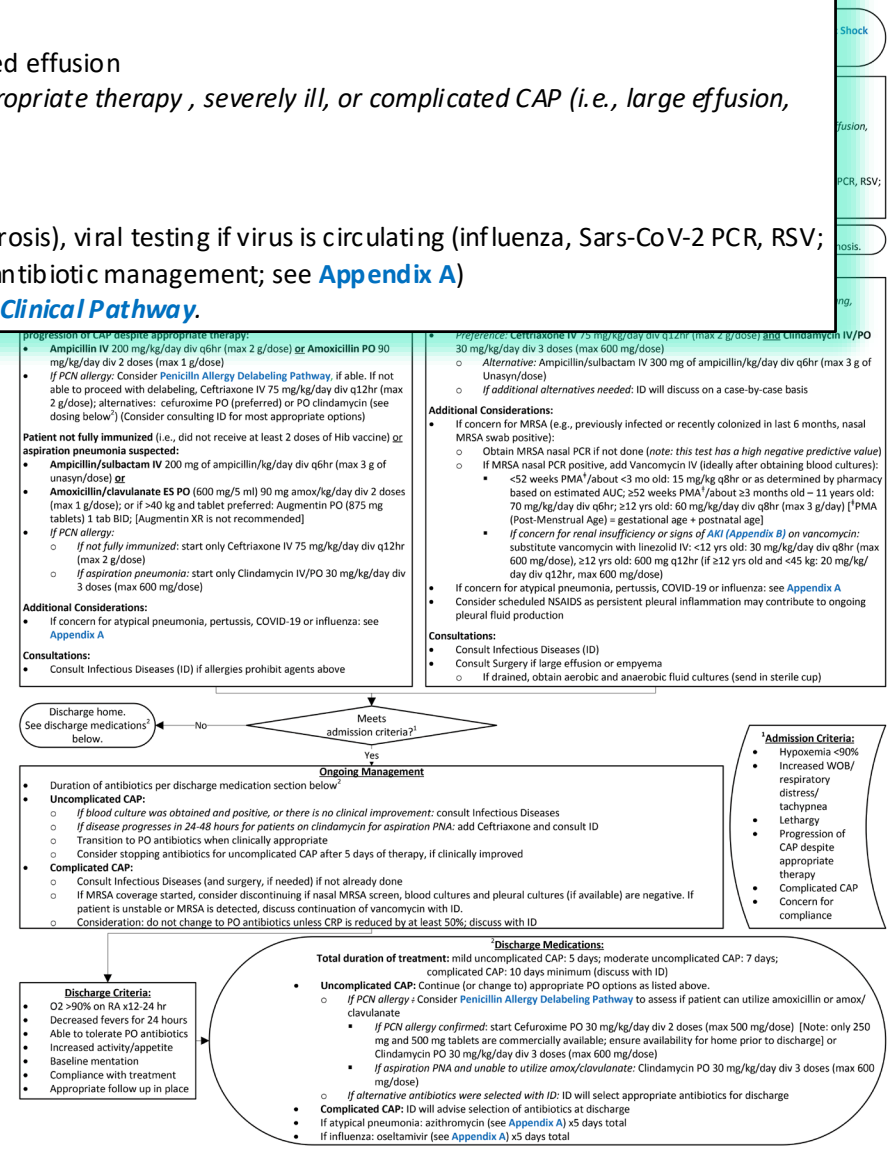
**Initial Evaluation:**

- 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 PCR if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE and/or Pertussis PCR 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
  - At times, POCUS trained ED physicians may perform bedside lung ultrasound
- Ultrasound will help evaluate effusion size and if presence of loculated/septated effusion




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

*CLINICAL PATHWAY:*

# Community Acquired Pneumonia (CAP)

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

**Initial Evaluation:**

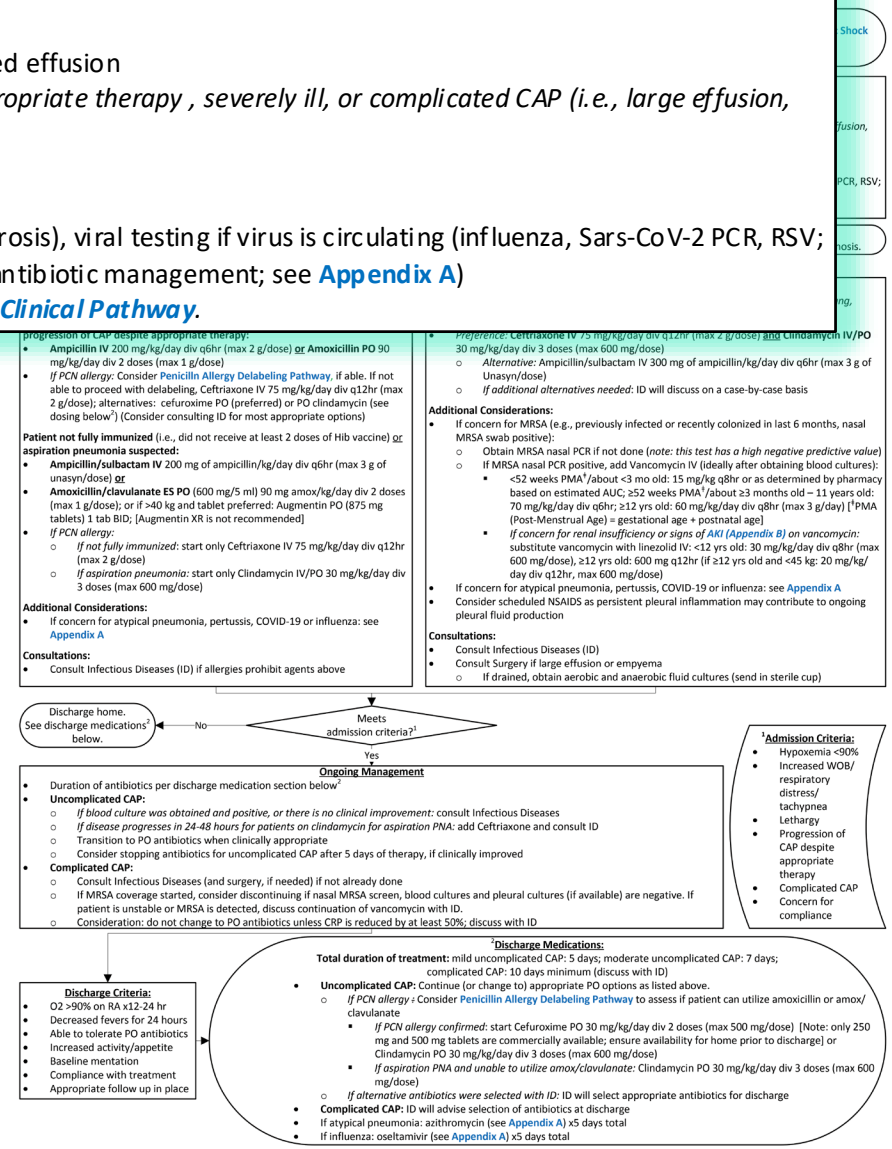
- CXR
- *If moderate-large effusion:* consider obtaining ultrasound to evaluate for size of effusion and loculated/septated effusion
- *If under immunized for Hib (i.e., did not receive at least 2 doses of Hib vaccine), progression of CAP despite appropriate therapy , severely ill, or complicated CAP (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 PCR if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE and/or Pertussis PCR 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.***

## 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!*




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

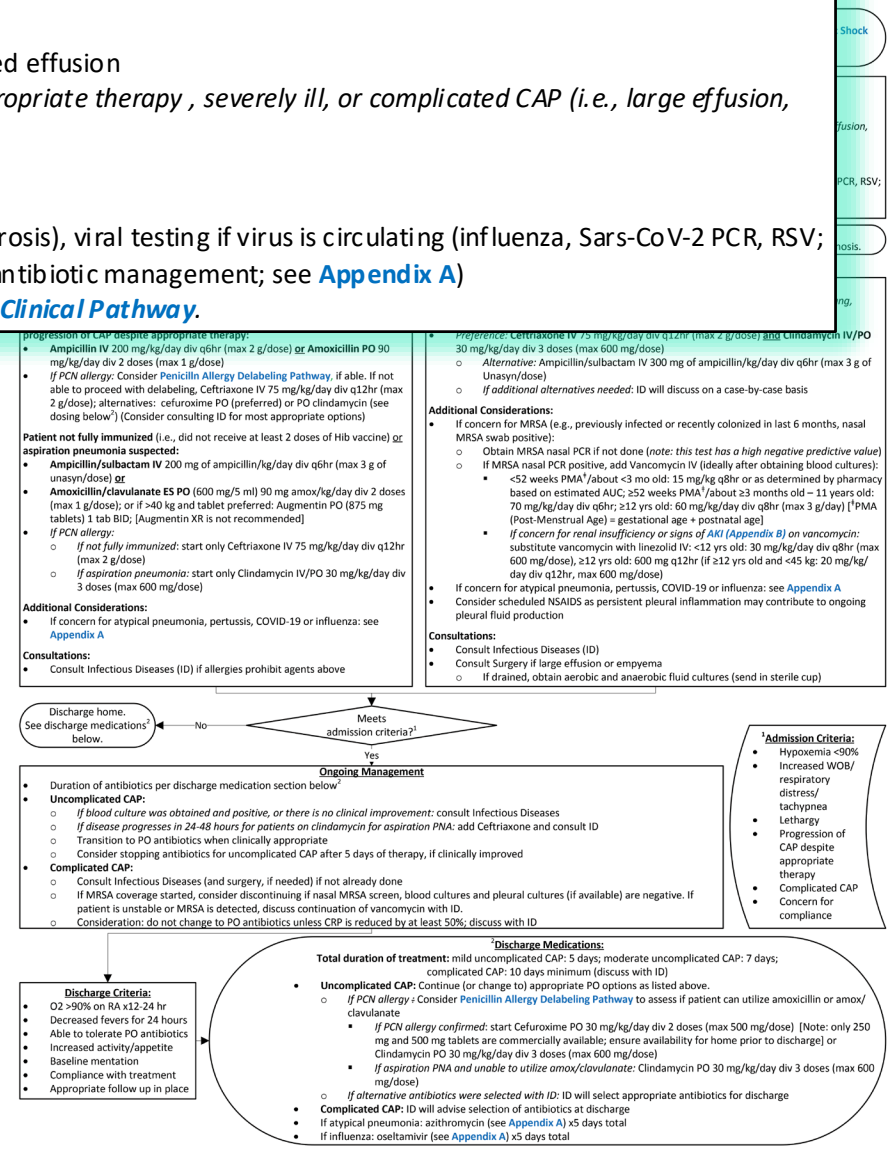
**Initial Evaluation:**

- 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 PCR if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE and/or Pertussis PCR 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.***

## Blood Work

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




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

**Initial Evaluation:**

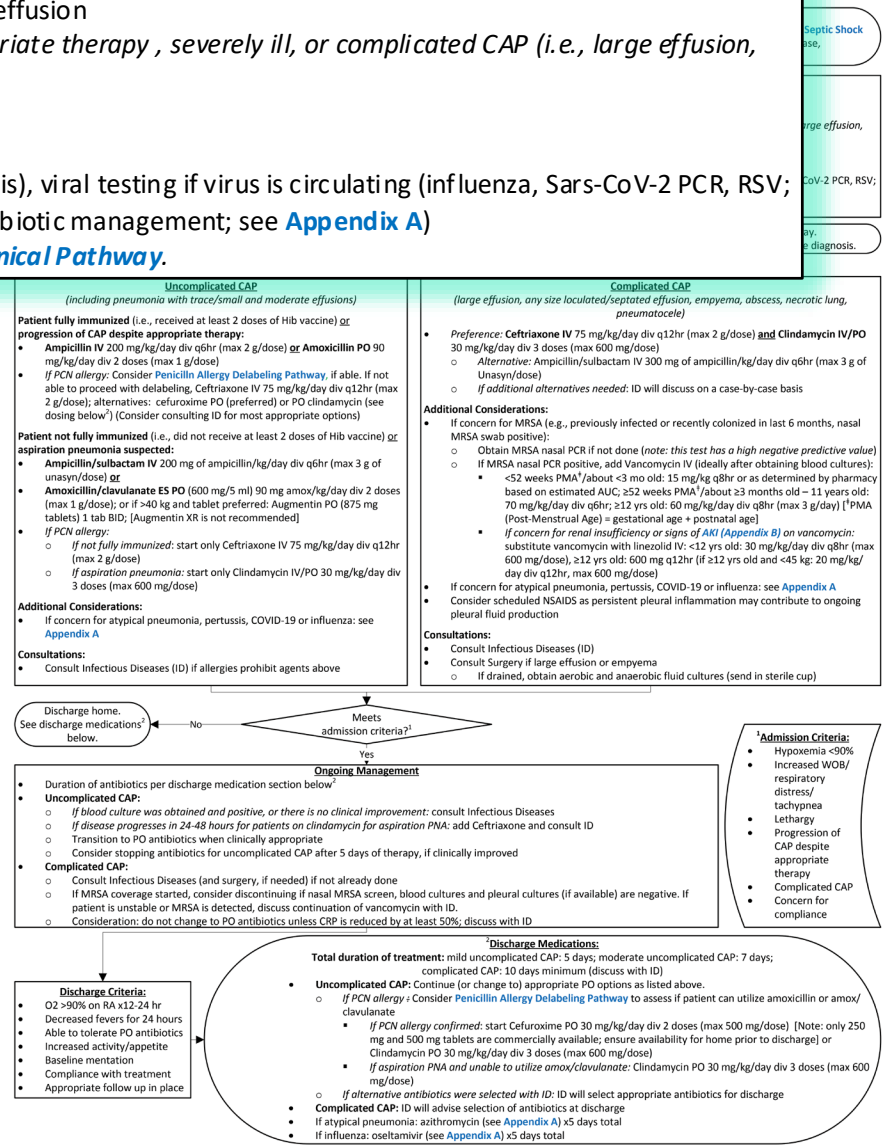
- CXR
- *If moderate-large effusion:* consider obtaining ultrasound to evaluate for size of effusion and loculated/septated effusion
- *If under immunized for Hib (i.e., did not receive at least 2 doses of Hib vaccine), progression of CAP despite appropriate therapy , severely ill, or complicated CAP (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 PCR if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE and/or Pertussis PCR 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.***

## 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!**




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

*CLINICAL PATHWAY:*

# Community Acquired Pneumonia (CAP)

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

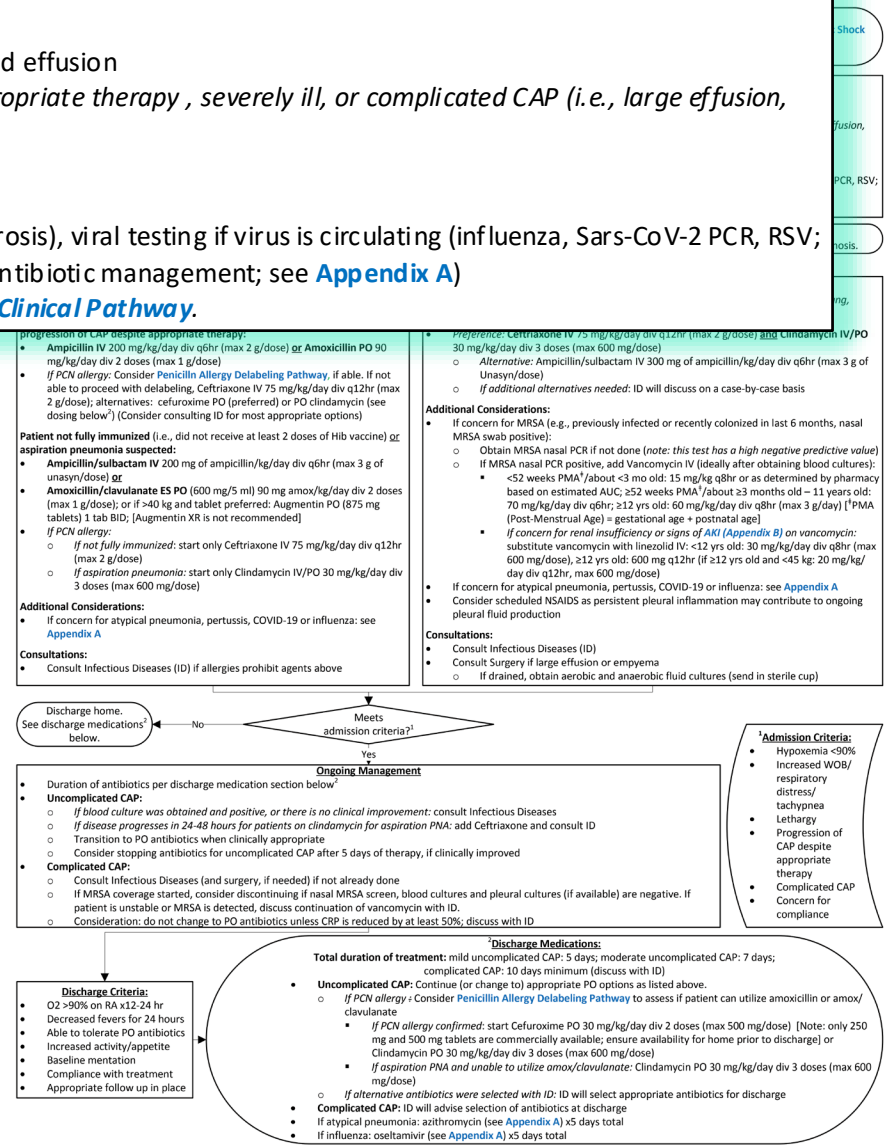
**Initial Evaluation:**

- 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 PCR if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE and/or Pertussis PCR 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)




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

*CLINICAL PATHWAY:*

# Community Acquired Pneumonia (CAP)

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

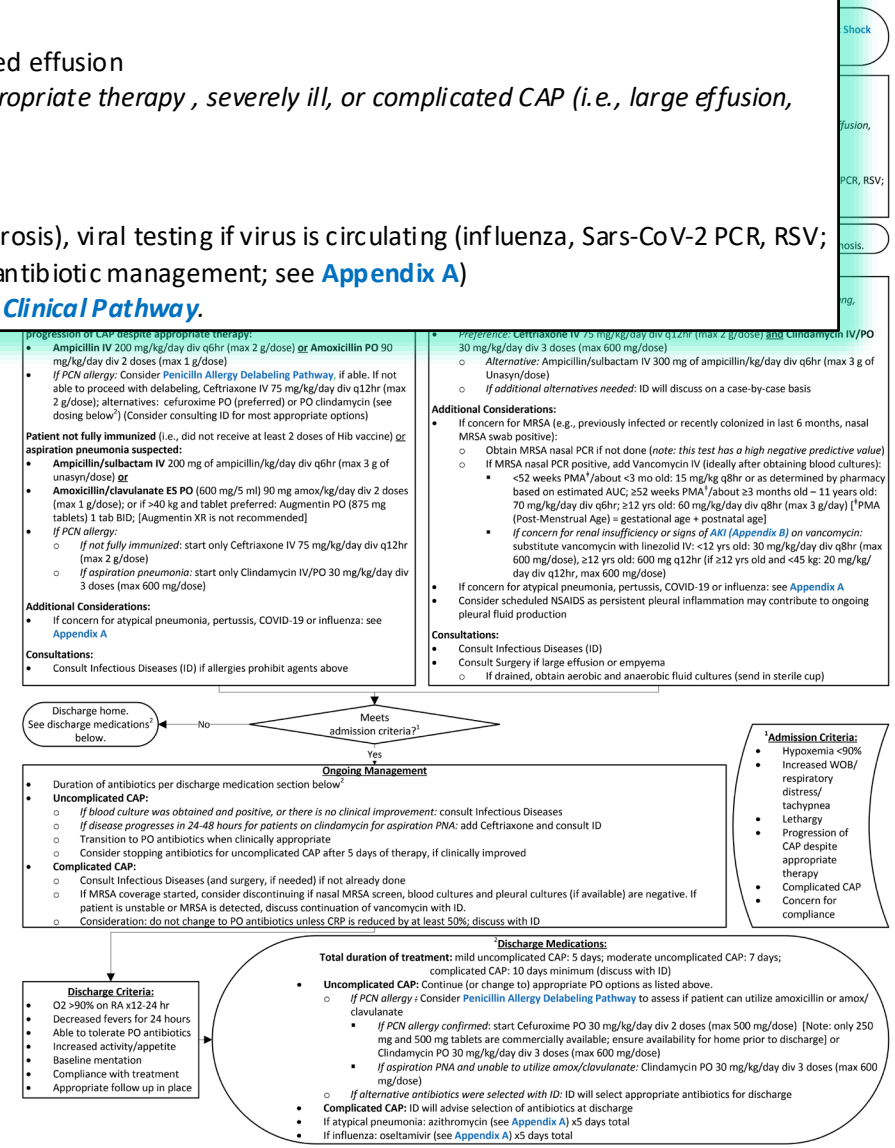
**Initial Evaluation:**

- 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 PCR if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE and/or Pertussis PCR 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 and/or Pertussis PCR 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




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

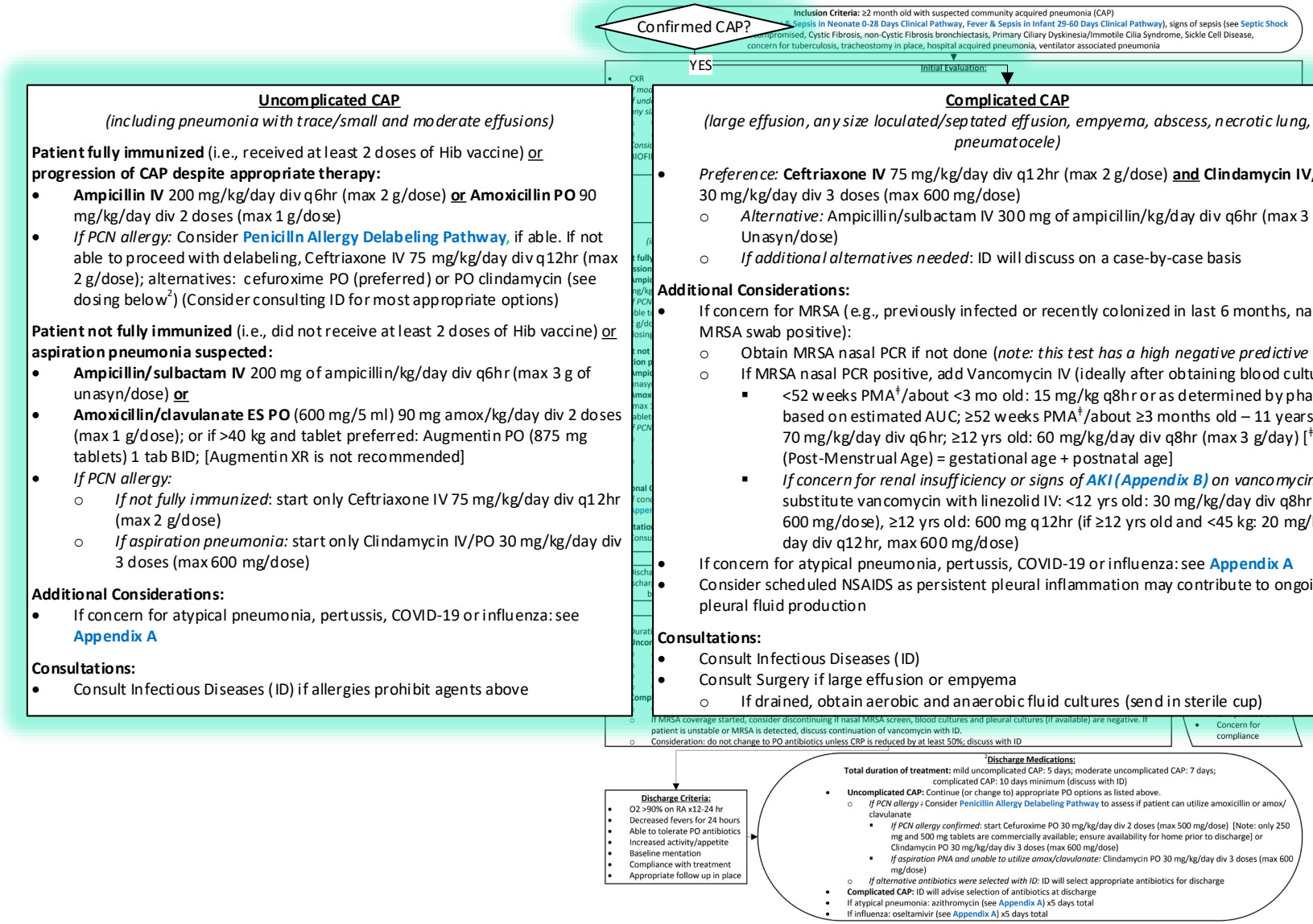
**If CAP is confirmed, management will be divided into uncomplicated and complicated CAP**

- Etiology (and recommended 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

*CLINICAL PATHWAY:*

# Community Acquired Pneumonia (CAP)

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




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

## Uncomplicated CAP

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

*CLINICAL PATHWAY:*
**Community Acquired Pneumonia (CAP)**

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

**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:* Consider **Penicilln Allergy Delabeling Pathway**, if able. If not able to proceed with delabeling, Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose); alternatives: cefuroxime PO (preferred) or PO clindamycin (see dosing below[2]) (Consider consulting ID for most appropriate options)

**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**
- **Amoxicillin/clavulanate ES PO** (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose); or if >40 kg and tablet preferred: Augmentin PO (875 mg tablets) 1 tab BID; [Augmentin XR is not recommended]
- *If PCN allergy:*
  - *If not fully immunized*: start only Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose)
  - *If aspiration pneumonia:* start only Clindamycin IV/PO 30 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) if allergies prohibit agents above

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25



Connecticut Children's

# 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 long between fevers, height of fever) 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:* Consider **Penicilln Allergy Delabeling Pathway**, if able. If not able to proceed with delabeling, Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose); alternatives: cefuroxime PO (preferred) or PO clindamycin (see dosing below[2]) (Consider consulting ID for most appropriate options)

**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**
- **Amoxicillin/clavulanate ES PO** (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose); or if >40 kg and tablet preferred: Augmentin PO (875 mg tablets) 1 tab BID; [Augmentin XR is not recommended]
- *If PCN allergy:*
    - *If not fully immunized*: start only Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose)
    - *If aspiration pneumonia:* start only Clindamycin IV/PO 30 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) if allergies prohibit agents above

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25



Connecticut Children's

## Uncomplicated CAP

- If patient has a reported penicillin allergy, please consider the **Penicillin Allergy Delabeling Clinical Pathway**
- Perform a thorough penicillin allergy history!
  - Many patients have penicillin allergy noted in chart but may only have mild delayed reactions
  - Often not true allergies
- Majority of patients with penicillin allergy reported can tolerate a cephalosporin
  - Third generation cephalosporins are less cross-reactive with penicillin
  - Or, can choose clindamycin

- **Note**: these alternatives are not preferred. Narrowest coverage with ampicillin or amoxicillin is ideal!

*CLINICAL PATHWAY:*
**Community Acquired Pneumonia (CAP)**

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

**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:* Consider **Penicilln Allergy Delabeling Pathway**, if able. If not able to proceed with delabeling, Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose); alternatives: cefuroxime PO (preferred) or PO clindamycin (see dosing below[2]) (Consider consulting ID for most appropriate options)

**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**
- **Amoxicillin/clavulanate ES PO** (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose); or if >40 kg and tablet preferred: Augmentin PO (875 mg tablets) 1 tab BID; [Augmentin XR is not recommended]
- *If PCN allergy:*
  - *If not fully immunized*: start only Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose)
  - *If aspiration pneumonia:* start only Clindamycin IV/PO 30 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) if allergies prohibit agents above

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25



Connecticut Children's

## Uncomplicated CAP

**If 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 penicillin allergy!
- If there is a penicillin 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:* Consider **Penicilln Allergy Delabeling Pathway**, if able. If not able to proceed with delabeling, Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose); alternatives: cefuroxime PO (preferred) or PO clindamycin (see dosing below[2]) (Consider consulting ID for most appropriate options)

**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**
- **Amoxicillin/clavulanate ES PO** (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose); or if >40 kg and tablet preferred: Augmentin PO (875 mg tablets) 1 tab BID; [Augmentin XR is not recommended]
- *If PCN allergy:*
  - *If not fully immunized*: start only Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose)
  - *If aspiration pneumonia:* start only Clindamycin IV/PO 30 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) if allergies prohibit agents above

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25



Connecticut Children's

## Uncomplicated CAP

**Aspiration Pneumonia:**

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

*CLINICAL PATHWAY:*
**Community Acquired Pneumonia (CAP)**

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

**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:* Consider **Penicilln Allergy Delabeling Pathway**, if able. If not able to proceed with delabeling, Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose); alternatives: cefuroxime PO (preferred) or PO clindamycin (see dosing below[2]) (Consider consulting ID for most appropriate options)

**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**
- **Amoxicillin/clavulanate ES PO** (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose); or if >40 kg and tablet preferred: Augmentin PO (875 mg tablets) 1 tab BID; [Augmentin XR is not recommended]
- *If PCN allergy:*
  - *If not fully immunized*: start only Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose)
  - *If aspiration pneumonia:* start only Clindamycin IV/PO 30 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) if allergies prohibit agents above

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25



Connecticut Children's

## 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:* Consider **Penicilln Allergy Delabeling Pathway**, if able. If not able to proceed with delabeling, Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose); alternatives: cefuroxime PO (preferred) or PO clindamycin (see dosing below[2]) (Consider consulting ID for most appropriate options)

**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**
- **Amoxicillin/clavulanate ES PO** (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose); or if >40 kg and tablet preferred: Augmentin PO (875 mg tablets) 1 tab BID; [Augmentin XR is not recommended]
- *If PCN allergy:*
  - *If not fully immunized*: start only Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose)
  - *If aspiration pneumonia:* start only Clindamycin IV/PO 30 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) if allergies prohibit agents above

CONTACTS: IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

# 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

**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

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

- **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**

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | JENNIFER GIROTTO, PHARMD | ILANA WAYNIK, MD

LAST UPDATED: 08.28.23

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

# Appendix A

## Pertussis

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

- ≥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 pneumonia*:**

- **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

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | JENNIFER GIROTTO, PHARMD | ILANA WAYNIK, MD

LAST UPDATED: 08.28.23

**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 pneumonia, 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 pneumonia*:**

- **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

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | JENNIFER GIROTTO, PHARMD | ILANA WAYNIK, MD

LAST UPDATED: 08.28.23

**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

# 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 pneumonia,* azithromycin does **not** have to automatically be added
- Resistances are emerging for *Strep pneumo*.
  - Never use as monotherapy (unless documented pertussis)

**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 pneumonia*:**

- **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

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | JENNIFER GIROTTO, PHARMD | ILANA WAYNIK, MD

LAST UPDATED: 08.28.23

# Appendix A

## Influenza

- If influenza is documented, add oseltamavir

## COVID-19

- COVID screening and management are discussed on these linked pathways



Special Considerations:

**Documented Influenza:**

- Those who receive oseltamavir <2 days from hospital admission have been shown to have shorter length of stays
- **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
- **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

**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

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | JENNIFER GIROTTO, PHARMD | ILANA WAYNIK, MD

LAST UPDATED: 08.28.23

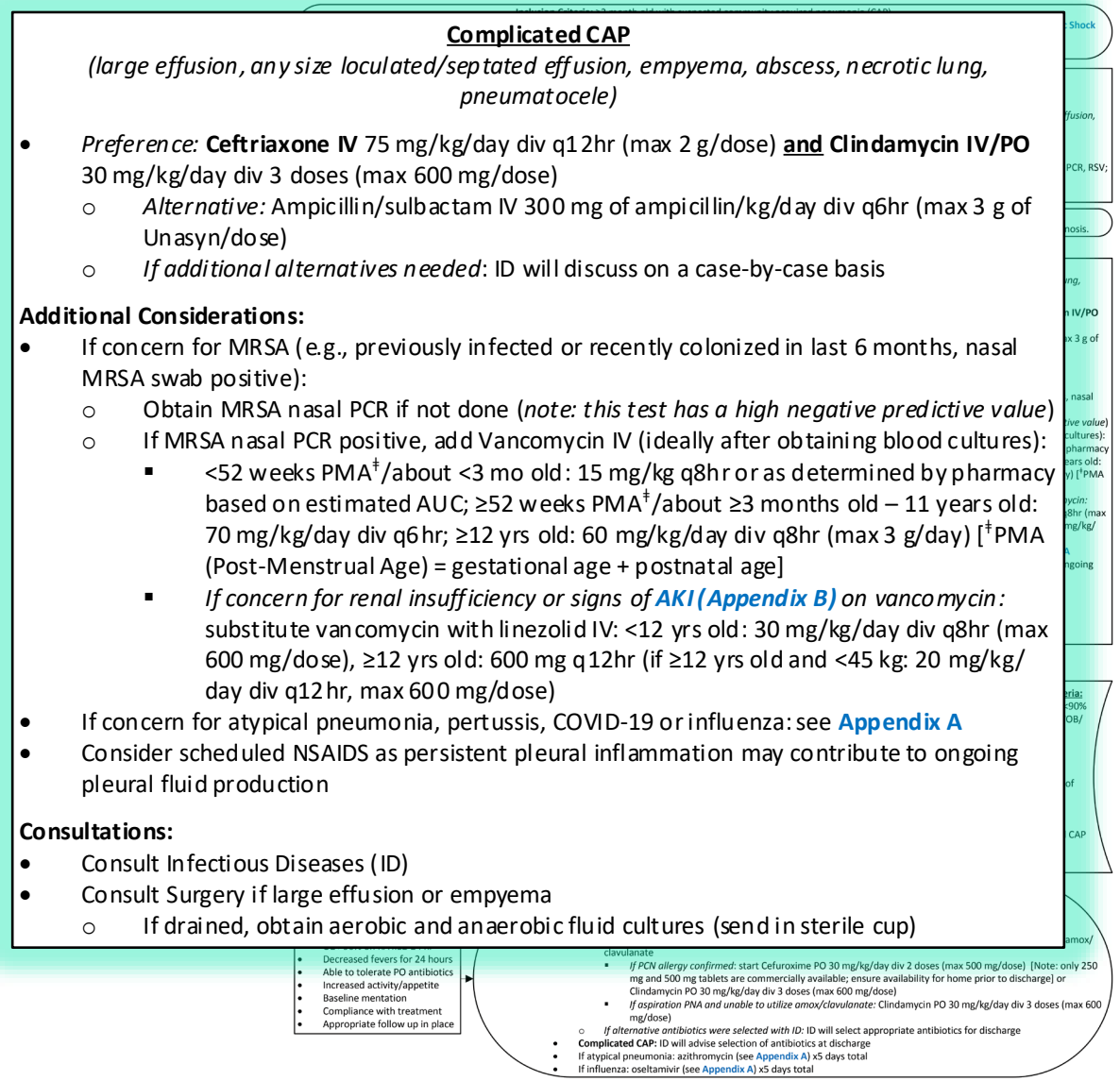
## Complicated CAP

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/day div q12hr (max 2 g/dose) **and** **Clindamycin IV/PO** 30 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*: ID will discuss on a case-by-case basis

**Additional Considerations:**

- If concern for MRSA (e.g., previously infected or recently colonized in last 6 months, nasal MRSA swab positive):
  - Obtain MRSA nasal PCR if not done (*note: this test has a high negative predictive value*)
  - If MRSA nasal PCR positive, add Vancomycin IV (ideally after obtaining blood cultures):
    - <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 (max 3 g/day) [‡PMA (Post-Menstrual Age) = gestational age + postnatal age]
    - *If concern for renal insufficiency or signs of **AKI (Appendix B)** on vancomycin:* substitute vancomycin with linezolid IV: <12 yrs old: 30 mg/kg/day div q8hr (max 600 mg/dose), ≥12 yrs old: 600 mg q12hr (if ≥12 yrs old and <45 kg: 20 mg/kg/day div q12hr, max 600 mg/dose)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see **Appendix A**
- Consider scheduled NSAIDS as persistent pleural inflammation may contribute to ongoing pleural fluid production

**Consultations:**

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

## Complicated CAP

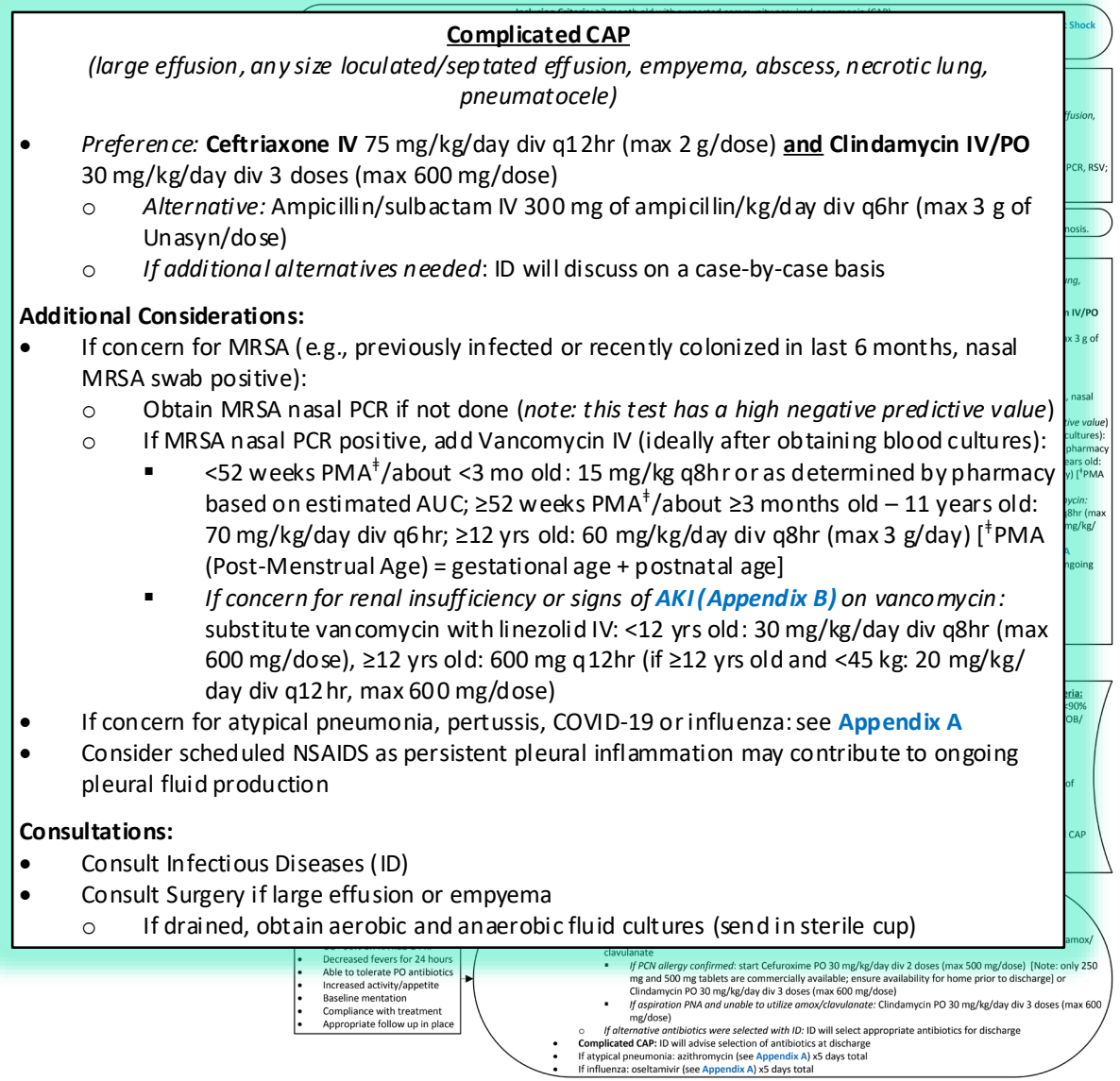
### Etiology of complicated CAP

- In addition to usual culprits, think of anaerobes (even without a clear history 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/day div q12hr (max 2 g/dose) **and** **Clindamycin IV/PO** 30 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*: ID will discuss on a case-by-case basis

**Additional Considerations:**

- If concern for MRSA (e.g., previously infected or recently colonized in last 6 months, nasal MRSA swab positive):
  - Obtain MRSA nasal PCR if not done (*note: this test has a high negative predictive value*)
  - If MRSA nasal PCR positive, add Vancomycin IV (ideally after obtaining blood cultures):
    - <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 (max 3 g/day) [‡PMA (Post-Menstrual Age) = gestational age + postnatal age]
    - *If concern for renal insufficiency or signs of **AKI (Appendix B)** on vancomycin:* substitute vancomycin with linezolid IV: <12 yrs old: 30 mg/kg/day div q8hr (max 600 mg/dose), ≥12 yrs old: 600 mg q12hr (if ≥12 yrs old and <45 kg: 20 mg/kg/day div q12hr, max 600 mg/dose)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see **Appendix A**
- Consider scheduled NSAIDS as persistent pleural inflammation may contribute to ongoing pleural fluid production

**Consultations:**

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

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

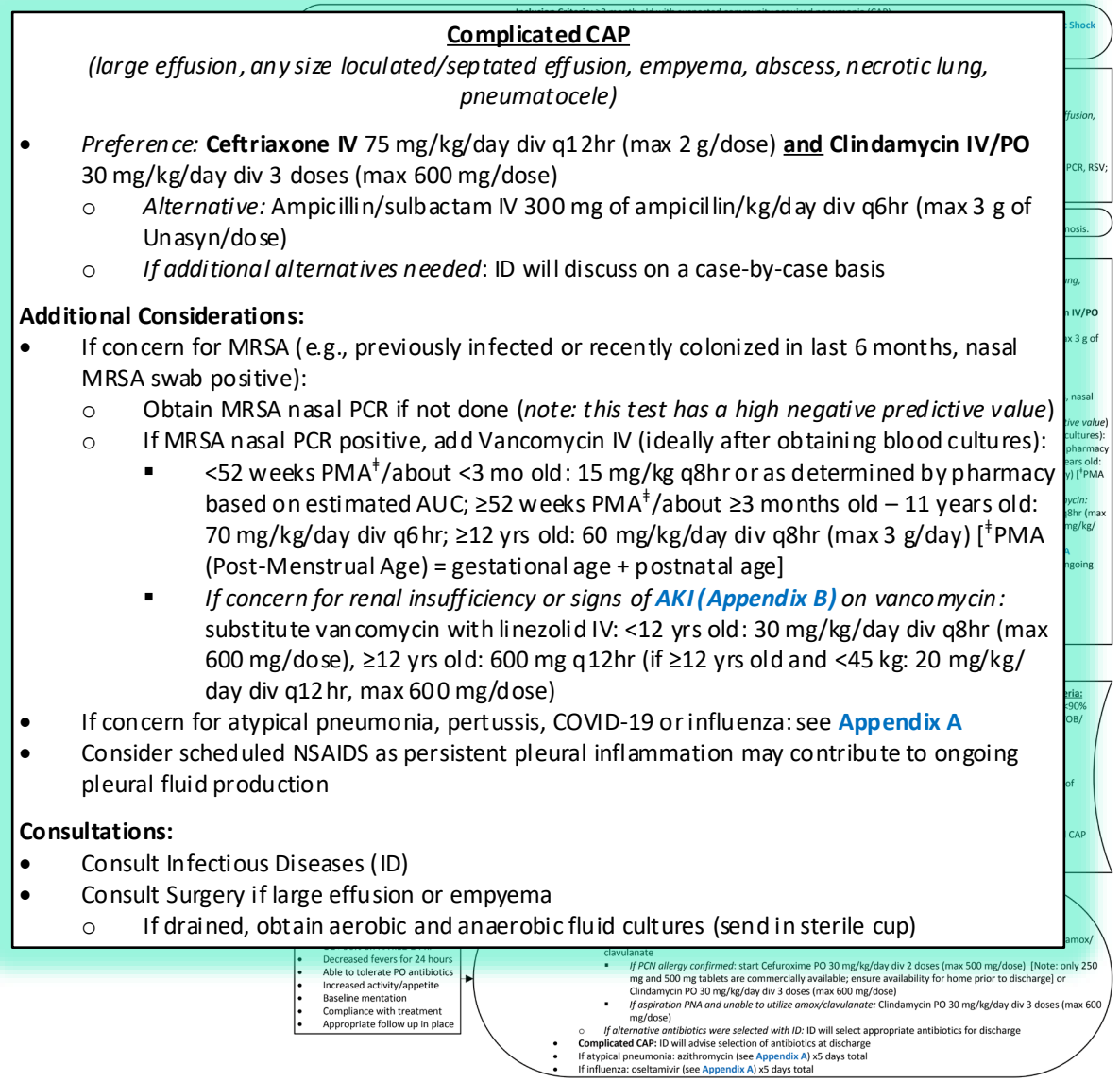
LAST UPDATED: 07.10.25

## 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)
- 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/day div q12hr (max 2 g/dose) **and** **Clindamycin IV/PO** 30 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*: ID will discuss on a case-by-case basis

**Additional Considerations:**

- If concern for MRSA (e.g., previously infected or recently colonized in last 6 months, nasal MRSA swab positive):
  - Obtain MRSA nasal PCR if not done (*note: this test has a high negative predictive value*)
  - If MRSA nasal PCR positive, add Vancomycin IV (ideally after obtaining blood cultures):
    - <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 (max 3 g/day) [‡PMA (Post-Menstrual Age) = gestational age + postnatal age]
    - *If concern for renal insufficiency or signs of **AKI (Appendix B)** on vancomycin:* substitute vancomycin with linezolid IV: <12 yrs old: 30 mg/kg/day div q8hr (max 600 mg/dose), ≥12 yrs old: 600 mg q12hr (if ≥12 yrs old and <45 kg: 20 mg/kg/day div q12hr, max 600 mg/dose)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see **Appendix A**
- Consider scheduled NSAIDS as persistent pleural inflammation may contribute to ongoing pleural fluid production

**Consultations:**

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

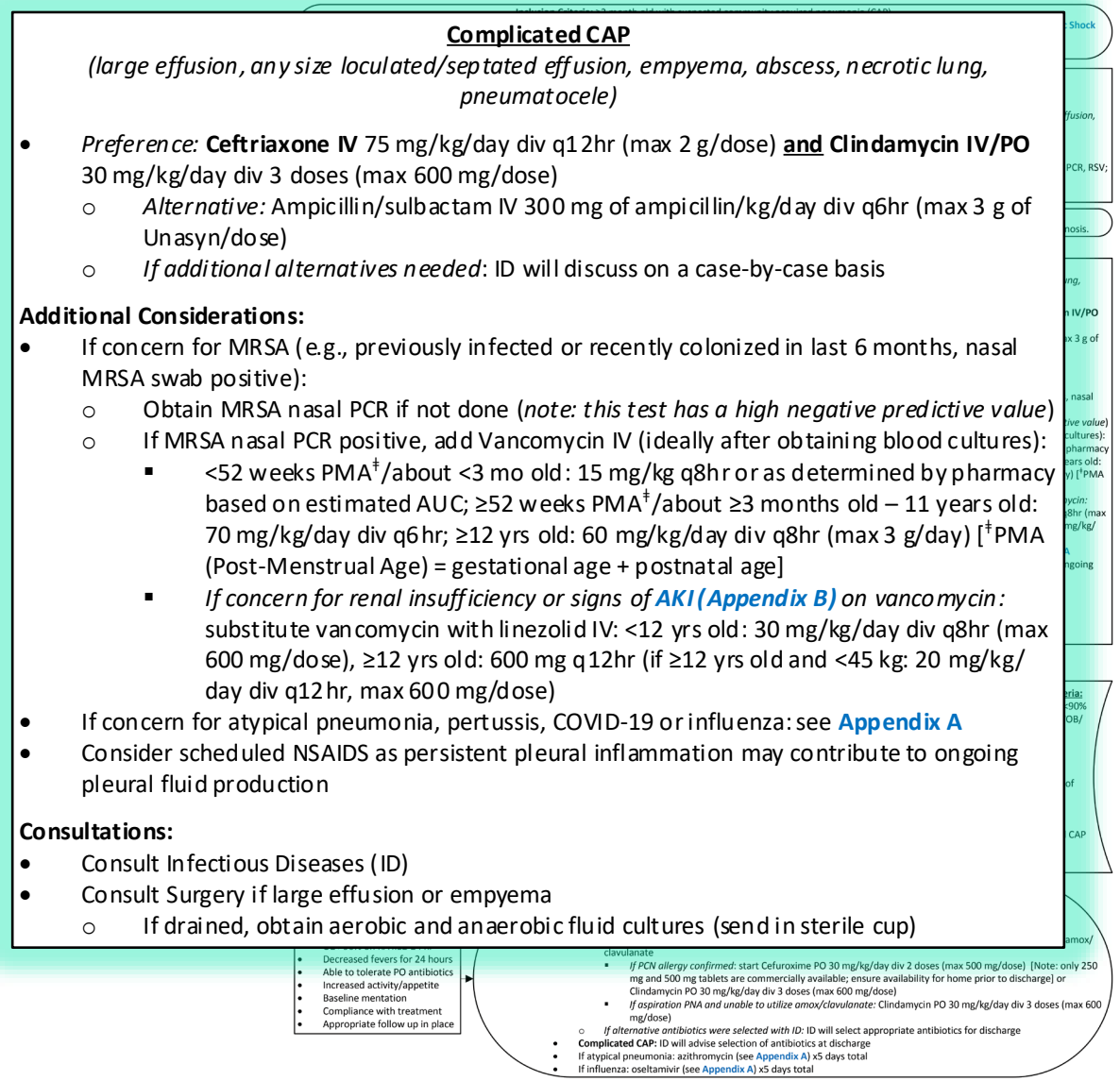
**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

## 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/day div q12hr (max 2 g/dose) **and** **Clindamycin IV/PO** 30 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*: ID will discuss on a case-by-case basis

**Additional Considerations:**

- If concern for MRSA (e.g., previously infected or recently colonized in last 6 months, nasal MRSA swab positive):
  - Obtain MRSA nasal PCR if not done (*note: this test has a high negative predictive value*)
  - If MRSA nasal PCR positive, add Vancomycin IV (ideally after obtaining blood cultures):
    - <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 (max 3 g/day) [‡PMA (Post-Menstrual Age) = gestational age + postnatal age]
    - *If concern for renal insufficiency or signs of **AKI (Appendix B)** on vancomycin:* substitute vancomycin with linezolid IV: <12 yrs old: 30 mg/kg/day div q8hr (max 600 mg/dose), ≥12 yrs old: 600 mg q12hr (if ≥12 yrs old and <45 kg: 20 mg/kg/day div q12hr, max 600 mg/dose)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see **Appendix A**
- Consider scheduled NSAIDS as persistent pleural inflammation may contribute to ongoing pleural fluid production

**Consultations:**

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

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

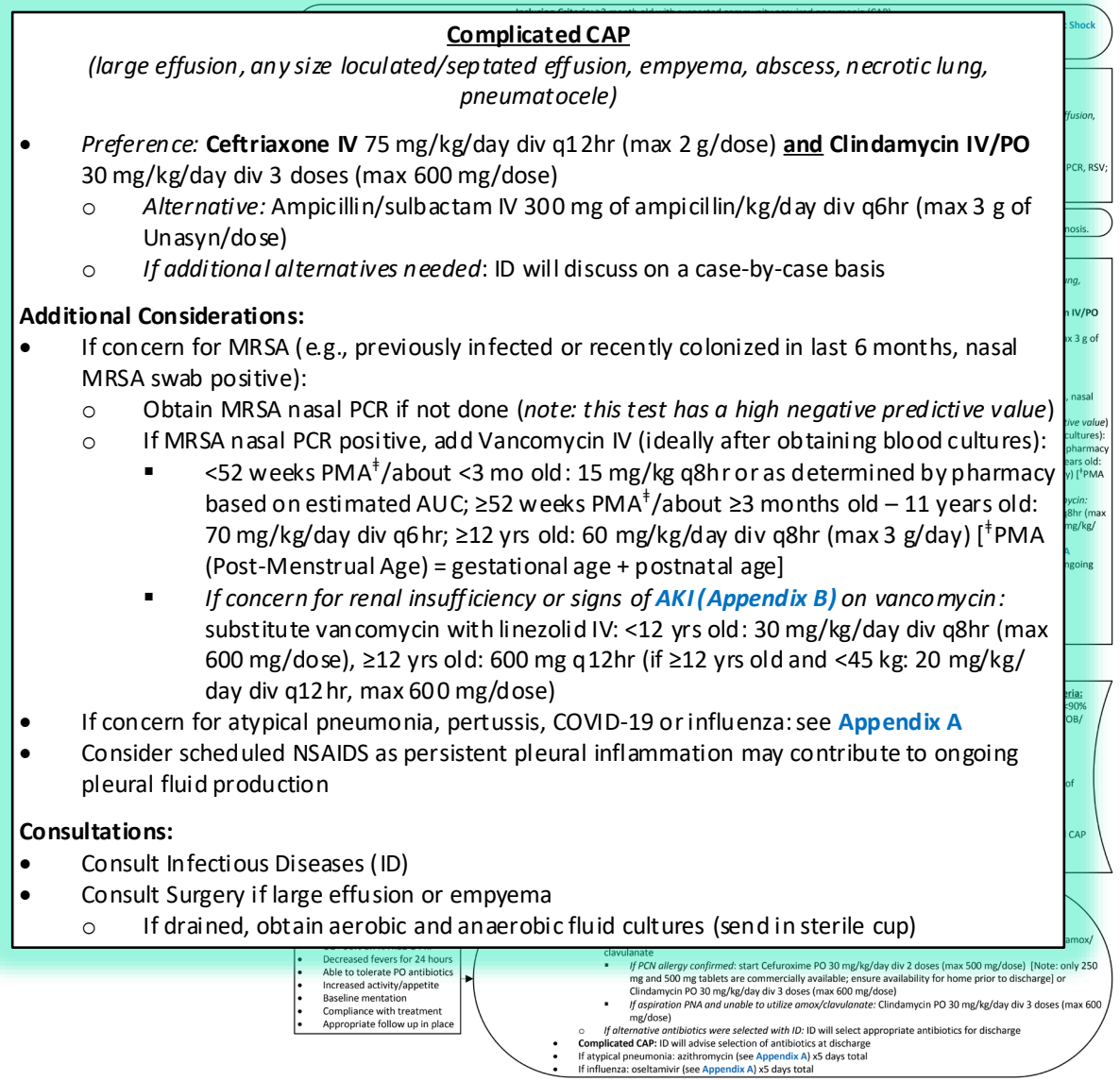
LAST UPDATED: 07.10.25

## Complicated CAP

### MRSA

- MRSA is a considered etiology for complicated CAP, particularly if the patient was previously infected, colonized in the last 6 months, or if the MRSA nasal PCR is positive
- Consider adding vancomycin coverage
- Remember that MRSA nasal CR has 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/day div q12hr (max 2 g/dose) **and** **Clindamycin IV/PO** 30 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*: ID will discuss on a case-by-case basis

**Additional Considerations:**

- If concern for MRSA (e.g., previously infected or recently colonized in last 6 months, nasal MRSA swab positive):
  - Obtain MRSA nasal PCR if not done (*note: this test has a high negative predictive value*)
  - If MRSA nasal PCR positive, add Vancomycin IV (ideally after obtaining blood cultures):
    - <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 (max 3 g/day) [‡PMA (Post-Menstrual Age) = gestational age + postnatal age]
    - *If concern for renal insufficiency or signs of **AKI (Appendix B)** on vancomycin:* substitute vancomycin with linezolid IV: <12 yrs old: 30 mg/kg/day div q8hr (max 600 mg/dose), ≥12 yrs old: 600 mg q12hr (if ≥12 yrs old and <45 kg: 20 mg/kg/day div q12hr, max 600 mg/dose)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see **Appendix A**
- Consider scheduled NSAIDS as persistent pleural inflammation may contribute to ongoing pleural fluid production

**Consultations:**

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

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

## Complicated CAP

- **Clinical Pearl: AKI**
  - Monitor closely for acute kidney injury, particularly if the patient is on vancomycin, NSAIDs, and if they received contrast
  - If AKI, may use linezolid in place of vancomycin
- AKI is defined in Appendix B
  - This is a new institution-wide definition

### Definition of Acute Kidney Injury (AKI)

*(It should be noted that this definition does not apply to children <1 year of age)*

AKI is defined by having ***either***:

- At least a 50% increase in Scr above baseline* **and** new Scr ≥0.5 mg/dL **OR**
- An increase by 0.3 mg/dL from baseline*, **and** new Scr ≥0.5 mg/dL

**If a baseline creatinine is unknown, estimate baseline Cr using the Schwartz Calculation (*baseline creatinine* = (0.413 ∗ height *cm*)/120 *GFR*). For patients with Chronic Kidney Disease (CKD), use the **CKiD U25 Calculator**.*

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

- *Preference:* **Ceftriaxone IV** 75 mg/kg/day div q12hr (max 2 g/dose) **and** **Clindamycin IV/PO** 30 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*: ID will discuss on a case-by-case basis

**Additional Considerations:**

- If concern for MRSA (e.g., previously infected or recently colonized in last 6 months, nasal MRSA swab positive):
  - Obtain MRSA nasal PCR if not done (*note: this test has a high negative predictive value*)
  - If MRSA nasal PCR positive, add Vancomycin IV (ideally after obtaining blood cultures):
    - <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 (max 3 g/day) [‡PMA (Post-Menstrual Age) = gestational age + postnatal age]
    - *If concern for renal insufficiency or signs of **AKI (Appendix B)** on vancomycin:* substitute vancomycin with linezolid IV: <12 yrs old: 30 mg/kg/day div q8hr (max 600 mg/dose), ≥12 yrs old: 600 mg q12hr (if ≥12 yrs old and <45 kg: 20 mg/kg/day div q12hr, max 600 mg/dose)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see **Appendix A**
- Consider scheduled NSAIDS as persistent pleural inflammation may contribute to ongoing pleural fluid production

**Consultations:**

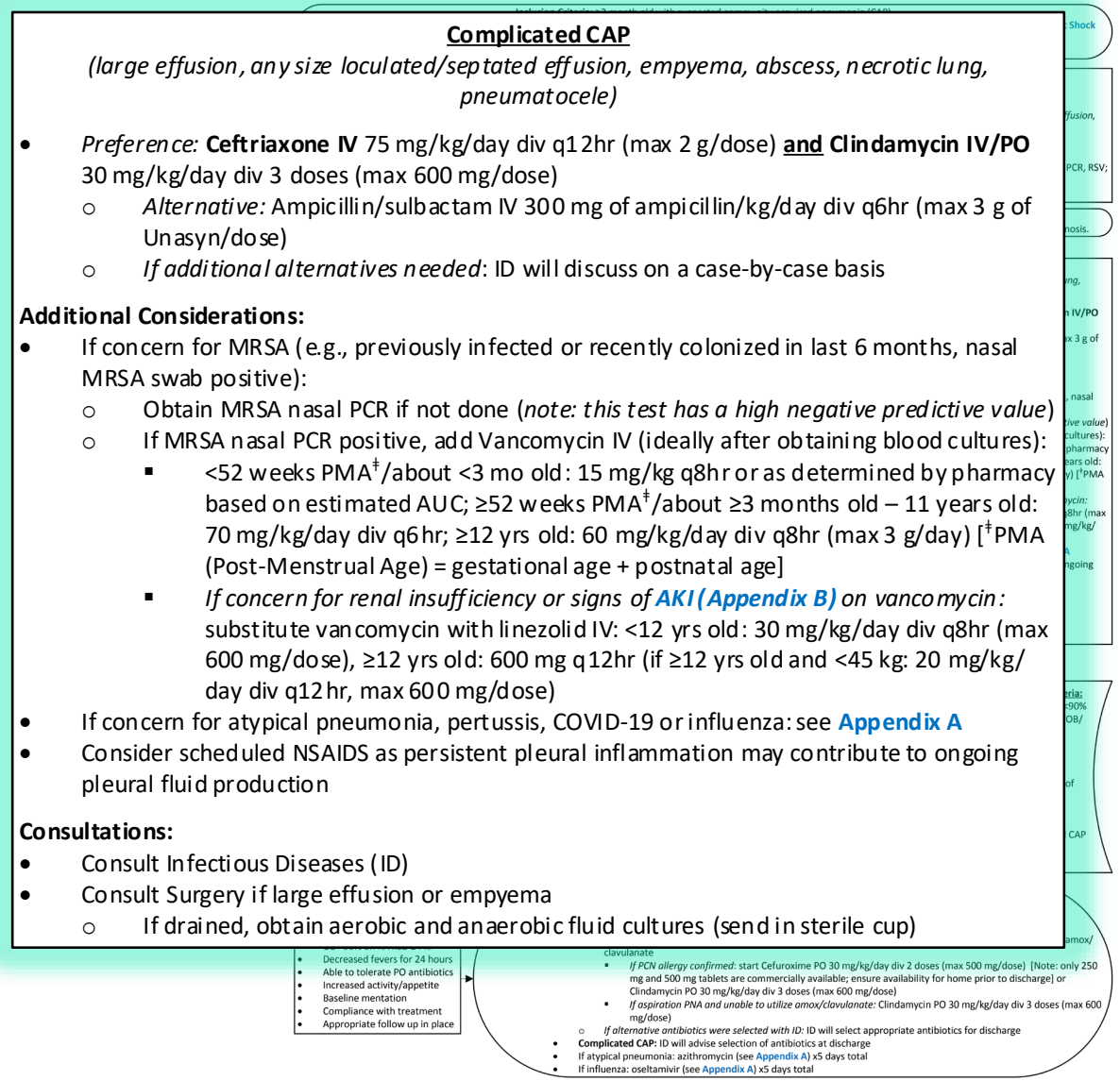
- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
  - If drained, obtain aerobic and anaerobic fluid cultures (send in sterile cup)

# Complicated CAP

## Consultations

- ID should be consulted for all cases of complicated CAP
- If there is a large effusion or empyema, consult surgery
  - **Remember to send aerobic and anaerobic fluid cultures to lab in a sterile cup if anything is drained!**





**Complicated CAP**

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

- *Preference:* **Ceftriaxone IV** 75 mg/kg/day div q12hr (max 2 g/dose) **and** **Clindamycin IV/PO** 30 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*: ID will discuss on a case-by-case basis

**Additional Considerations:**

- If concern for MRSA (e.g., previously infected or recently colonized in last 6 months, nasal MRSA swab positive):
  - Obtain MRSA nasal PCR if not done (*note: this test has a high negative predictive value*)
  - If MRSA nasal PCR positive, add Vancomycin IV (ideally after obtaining blood cultures):
    - <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 (max 3 g/day) [‡PMA (Post-Menstrual Age) = gestational age + postnatal age]
    - *If concern for renal insufficiency or signs of **AKI (Appendix B)** on vancomycin:* substitute vancomycin with linezolid IV: <12 yrs old: 30 mg/kg/day div q8hr (max 600 mg/dose), ≥12 yrs old: 600 mg q12hr (if ≥12 yrs old and <45 kg: 20 mg/kg/day div q12hr, max 600 mg/dose)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see **Appendix A**
- Consider scheduled NSAIDS as persistent pleural inflammation may contribute to ongoing pleural fluid production

**Consultations:**

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

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

*CLINICAL PATHWAY:*

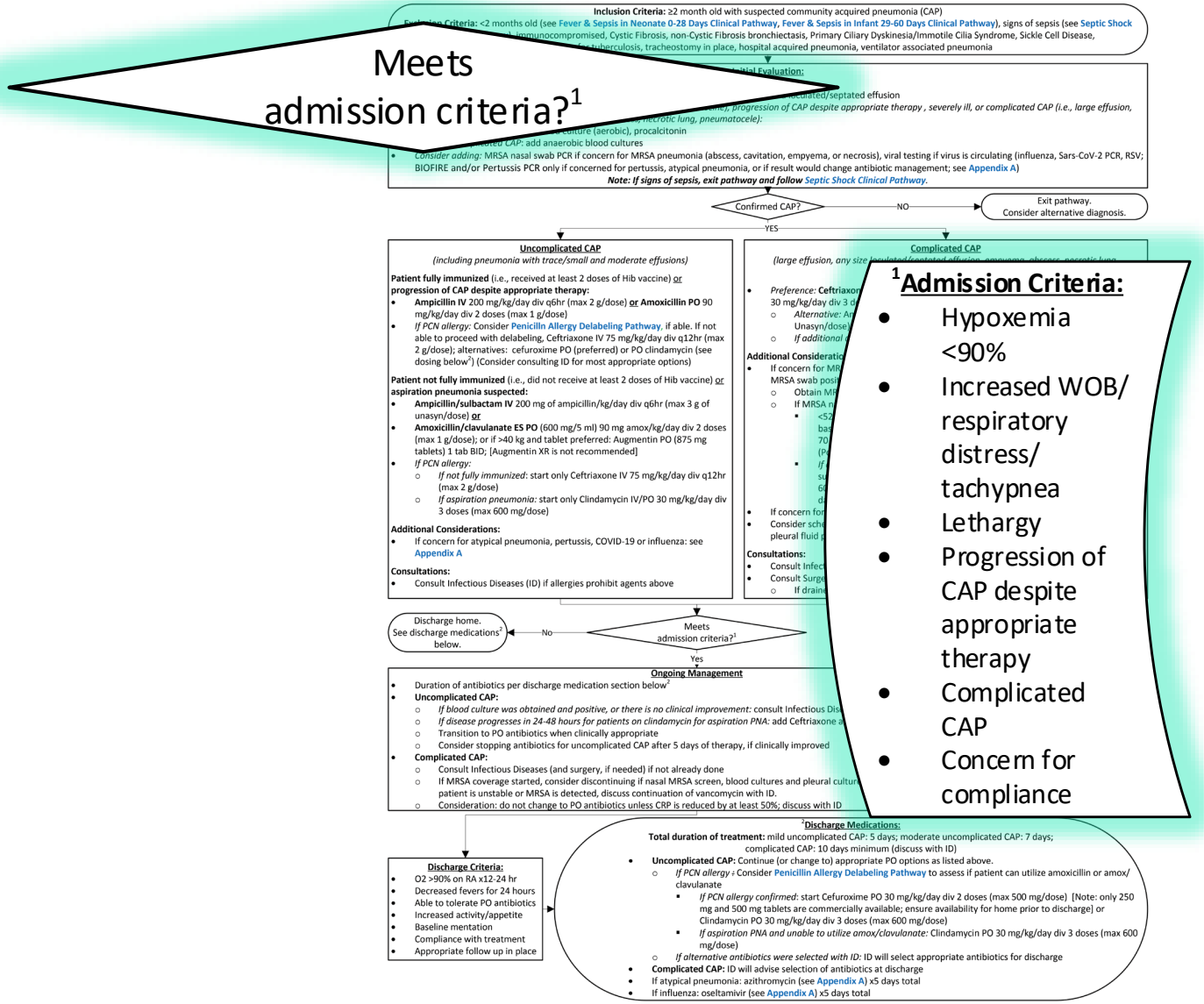
# Community Acquired Pneumonia (CAP)

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

## 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




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25



Connecticut Children's

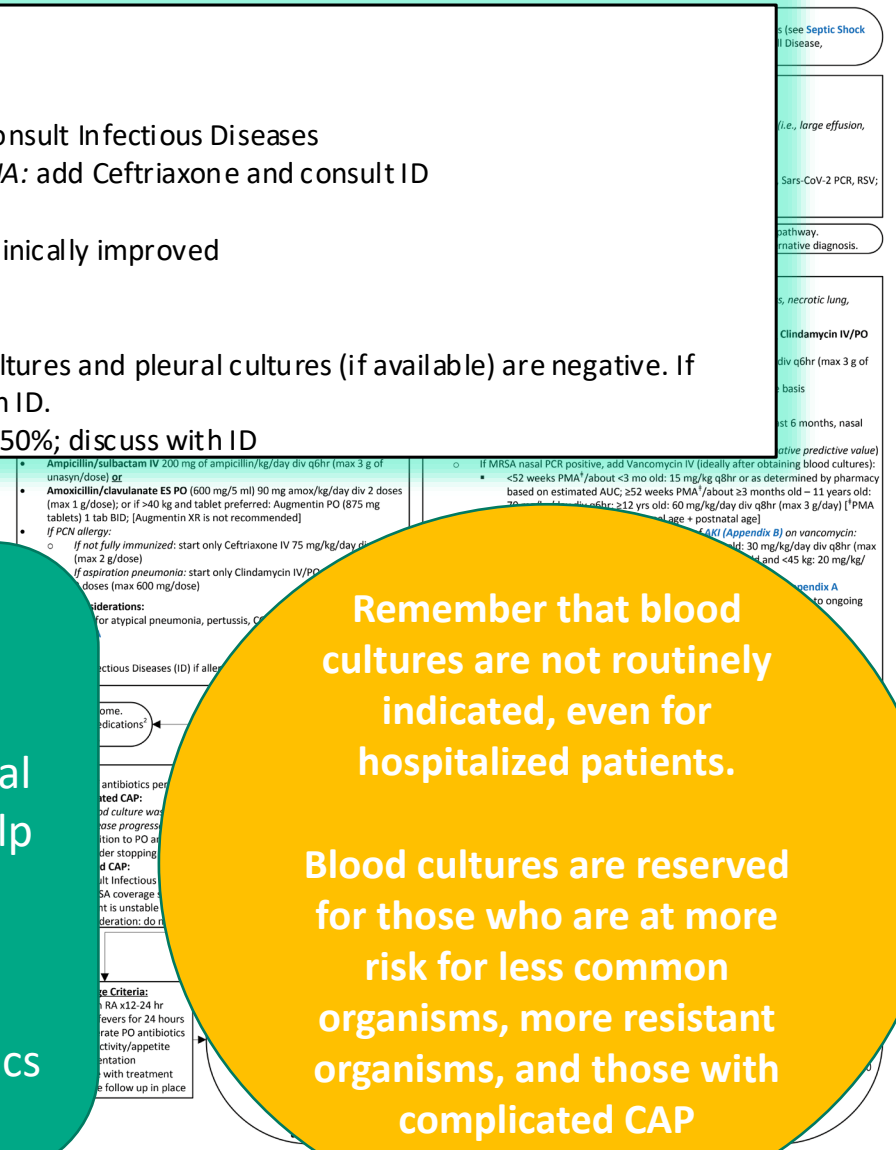
**Ongoing Management**

- Duration of antibiotics per discharge medication section below[2]
- **Uncomplicated CAP:**
  - *If blood culture was obtained and positive, or there is no clinical improvement:* consult Infectious Diseases
  - *If disease progresses in 24-48 hours for patients on clindamycin for aspiration PNA:* add Ceftriaxone and consult ID
  - Transition to PO antibiotics when clinically appropriate
  - 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 (if available) are negative. If patient is unstable or MRSA is detected, discuss continuation of vancomycin with ID.
  - Consideration: do not change to PO antibiotics unless CRP is reduced by at least 50%; discuss with ID

## 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
- If disease progresses in 24-48 hours for patients on clindamycin for aspiration PNA: add Ceftriaxone and consult ID
- 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.**

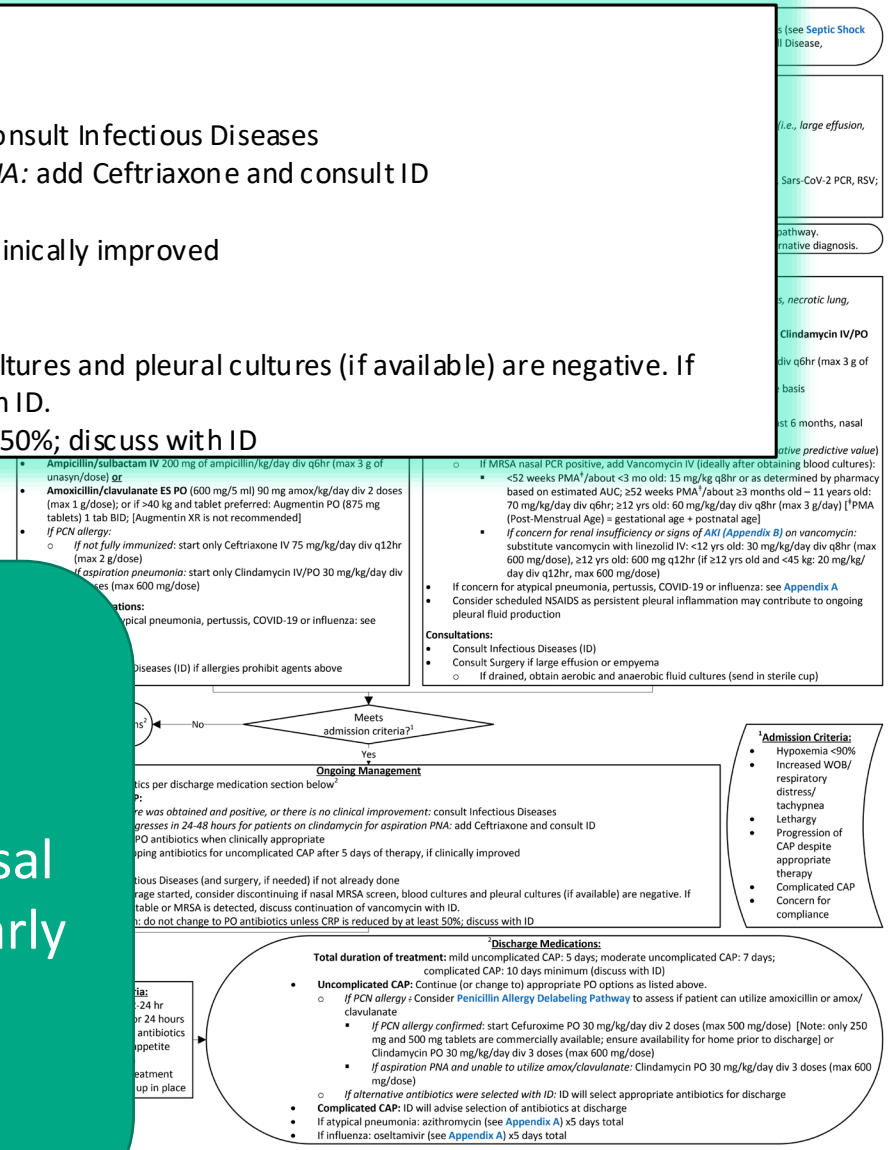
**Blood cultures are reserved for those who are at more risk for less common organisms, more resistant organisms, and those with complicated CAP**

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA V...

LAST UPDATED: 07.10.25

**Ongoing Management**

- Duration of antibiotics per discharge medication section below[2]
- **Uncomplicated CAP:**
  - *If blood culture was obtained and positive, or there is no clinical improvement:* consult Infectious Diseases
  - *If disease progresses in 24-48 hours for patients on clindamycin for aspiration PNA:* add Ceftriaxone and consult ID
  - Transition to PO antibiotics when clinically appropriate
  - 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 (if available) are negative. If patient is unstable or MRSA is detected, discuss continuation of vancomycin with ID.
  - Consideration: do not change to PO antibiotics unless CRP is reduced by at least 50%; discuss with ID




## Ongoing Management

### Complicated CAP

- Remember to consider stopping MRSA coverage if the nasal PCR 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

HELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

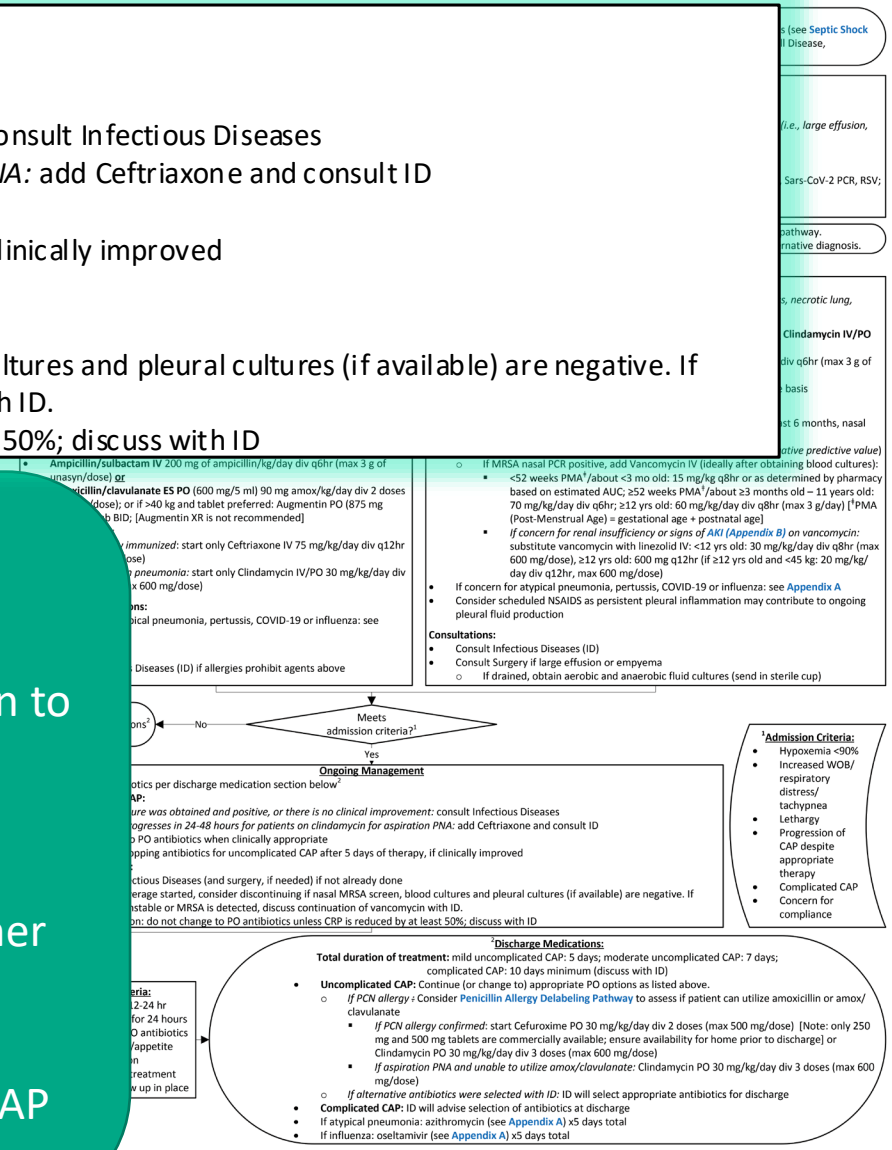
## Ongoing Management

- Duration of antibiotics per discharge medication section below[2]
- **Uncomplicated CAP:**
  - *If blood culture was obtained and positive, or there is no clinical improvement:* consult Infectious Diseases
  - *If disease progresses in 24-48 hours for patients on clindamycin for aspiration PNA:* add Ceftriaxone and consult ID
  - Transition to PO antibiotics when clinically appropriate
  - 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 (if available) are negative. If patient is unstable or MRSA is detected, discuss continuation of vancomycin with ID.
  - Consideration: do not change to PO antibiotics unless CRP is reduced by at least 50%; discuss with ID

## Ongoing Management (Inflammatory Markers)

**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
- NEW to pathway: do not transition to PO antibiotics for complicated CAP until CRP is reduced by at least 50% from peak




MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

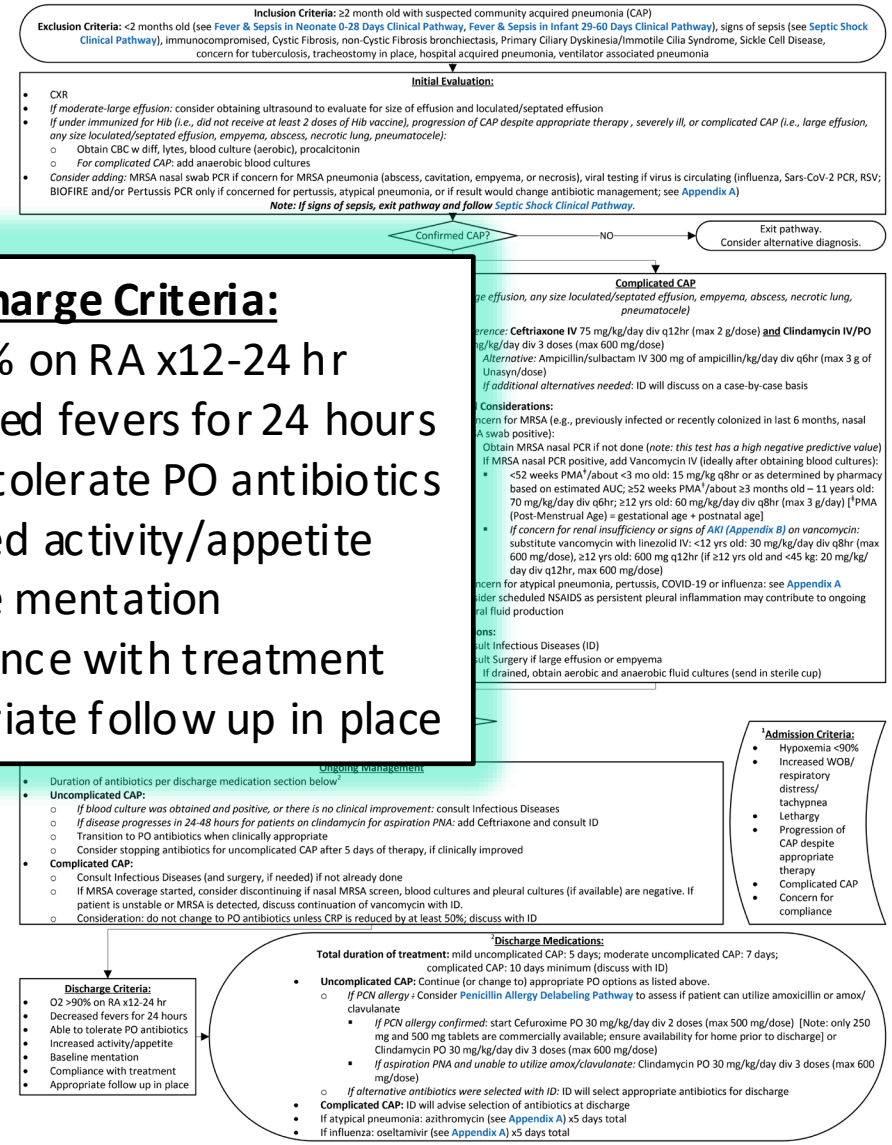
LAST UPDATED: 07.10.25

## Discharge Criteria

- Discharge criteria are listed

*CLINICAL PATHWAY:*
# Community Acquired Pneumonia (CAP)

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




## Discharge Criteria:

- O2 >90% on RA x12-24 hr
- Decreased fevers for 24 hours
- Able to tolerate PO antibiotics
- Increased activity/appetite
- Baseline mentation
- Compliance with treatment
- Appropriate follow up in place

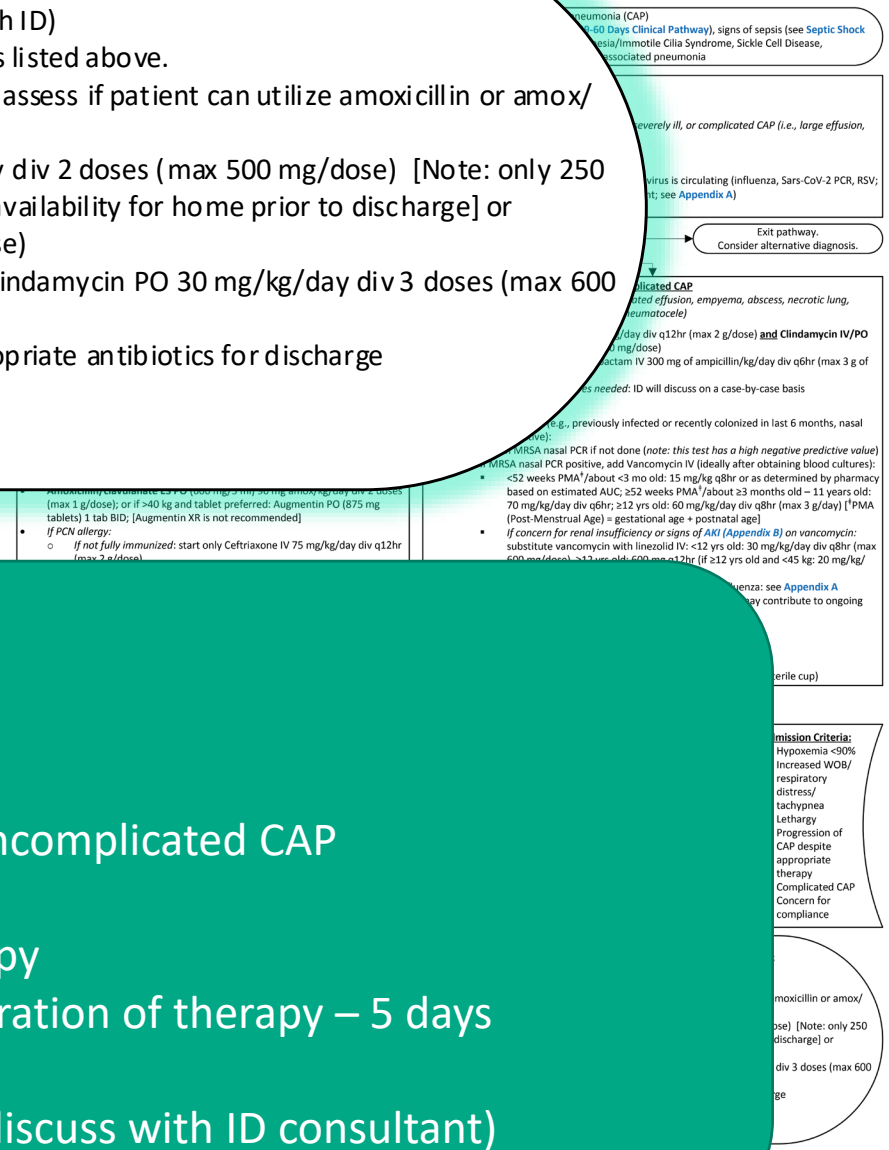
**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

[2]**Discharge Medications:**

**Total duration of treatment:** mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 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* ÷ Consider **Penicillin Allergy Delabeling Pathway** to assess if patient can utilize amoxicillin or amox/clavulanate
    - *If PCN allergy confirmed*: start Cefuroxime PO 30 mg/kg/day div 2 doses (max 500 mg/dose) [Note: only 250 mg and 500 mg tablets are commercially available; ensure availability for home prior to discharge] or Clindamycin PO 30 mg/kg/day div 3 doses (max 600 mg/dose)
    - *If aspiration PNA and unable to utilize amox/clavulanate:* Clindamycin PO 30 mg/kg/day div 3 doses (max 600 mg/dose)
  - *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 Medications

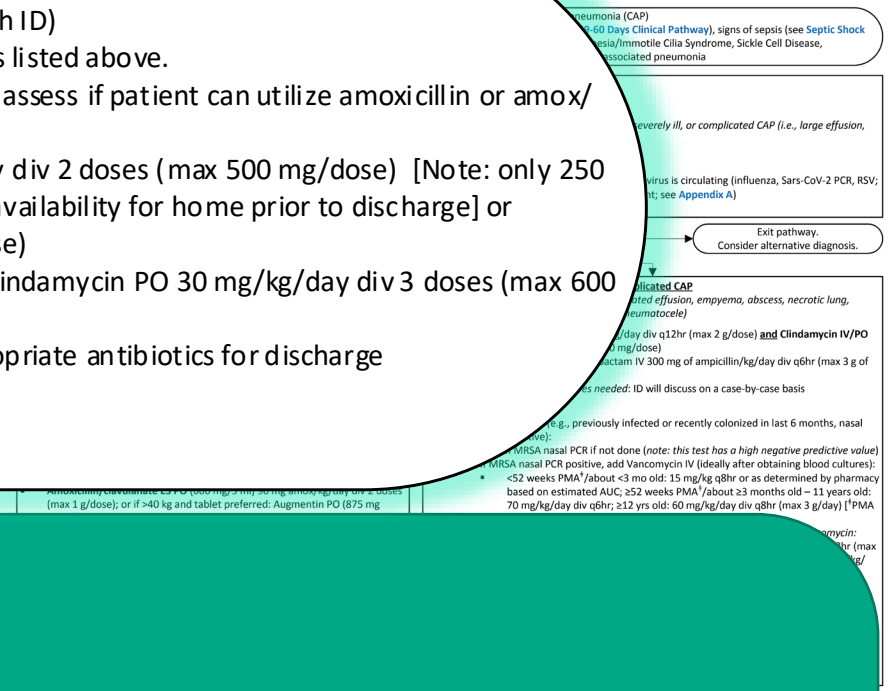
### Duration of treatment

- 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 7 days
- Complicated CAP should be treated for a minimum of 10 days (discuss with ID consultant)

[2]**Discharge Medications:**

**Total duration of treatment:** mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 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*: Consider **Penicillin Allergy Delabeling Pathway** to assess if patient can utilize amoxicillin or amox/clavulanate
    - *If PCN allergy confirmed*: start Cefuroxime PO 30 mg/kg/day div 2 doses (max 500 mg/dose) [Note: only 250 mg and 500 mg tablets are commercially available; ensure availability for home prior to discharge] or Clindamycin PO 30 mg/kg/day div 3 doses (max 600 mg/dose)
    - *If aspiration PNA and unable to utilize amox/clavulanate:* Clindamycin PO 30 mg/kg/day div 3 doses (max 600 mg/dose)
  - *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 Medications

**Uncomplicated CAP antibiotics**

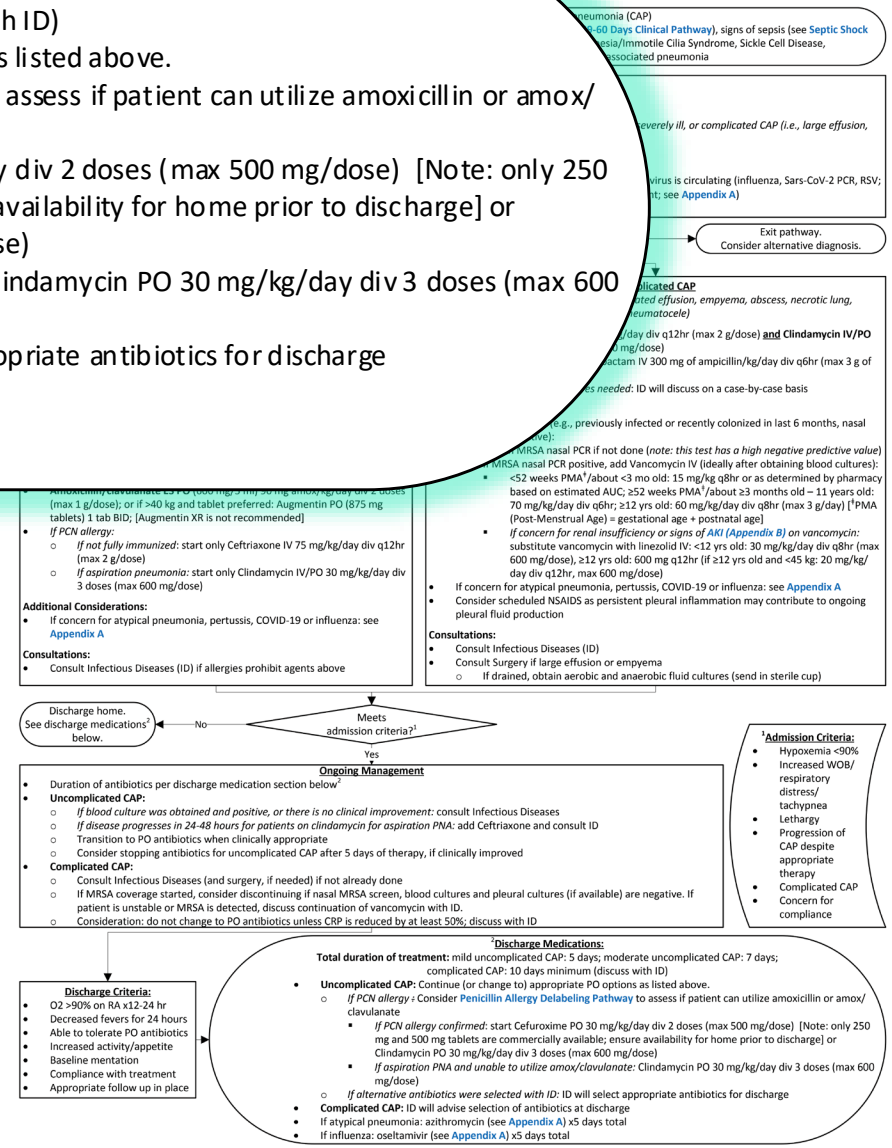
- Amoxicillin is the best and optimal coverage for *Strep pneumo*
  - Per IDSA: no oral cephalosporins provided activity at the site of infection that equaled high dose amoxicillin
  - Most 2nd and 3rd generation cephalosporins only provide adequate activity against 60-70% of the currently isolated strains of pneumococcus
- If the patient has a reported penicillin allergy, considering the **Penicillin Allergy Delabeling Clinical Pathway**
- If the patient has a **true** Penicillin allergy and was improving on ceftriaxone, can be placed on cefuroxime or clindamycin
  - Only 250 mg and 500 mg tablets are commercially available; ensure availability for home prior to discharge

Connecticut Children's

[2]**Discharge Medications:**

**Total duration of treatment:** mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 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*: Consider **Penicillin Allergy Delabeling Pathway** to assess if patient can utilize amoxicillin or amox/clavulanate
    - *If PCN allergy confirmed*: start Cefuroxime PO 30 mg/kg/day div 2 doses (max 500 mg/dose) [Note: only 250 mg and 500 mg tablets are commercially available; ensure availability for home prior to discharge] or Clindamycin PO 30 mg/kg/day div 3 doses (max 600 mg/dose)
    - *If aspiration PNA and unable to utilize amox/clavulanate:* Clindamycin PO 30 mg/kg/day div 3 doses (max 600 mg/dose)
  - *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 Medications

### Uncomplicated CAP antibiotics

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

**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

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

[2]**Discharge Medications:**

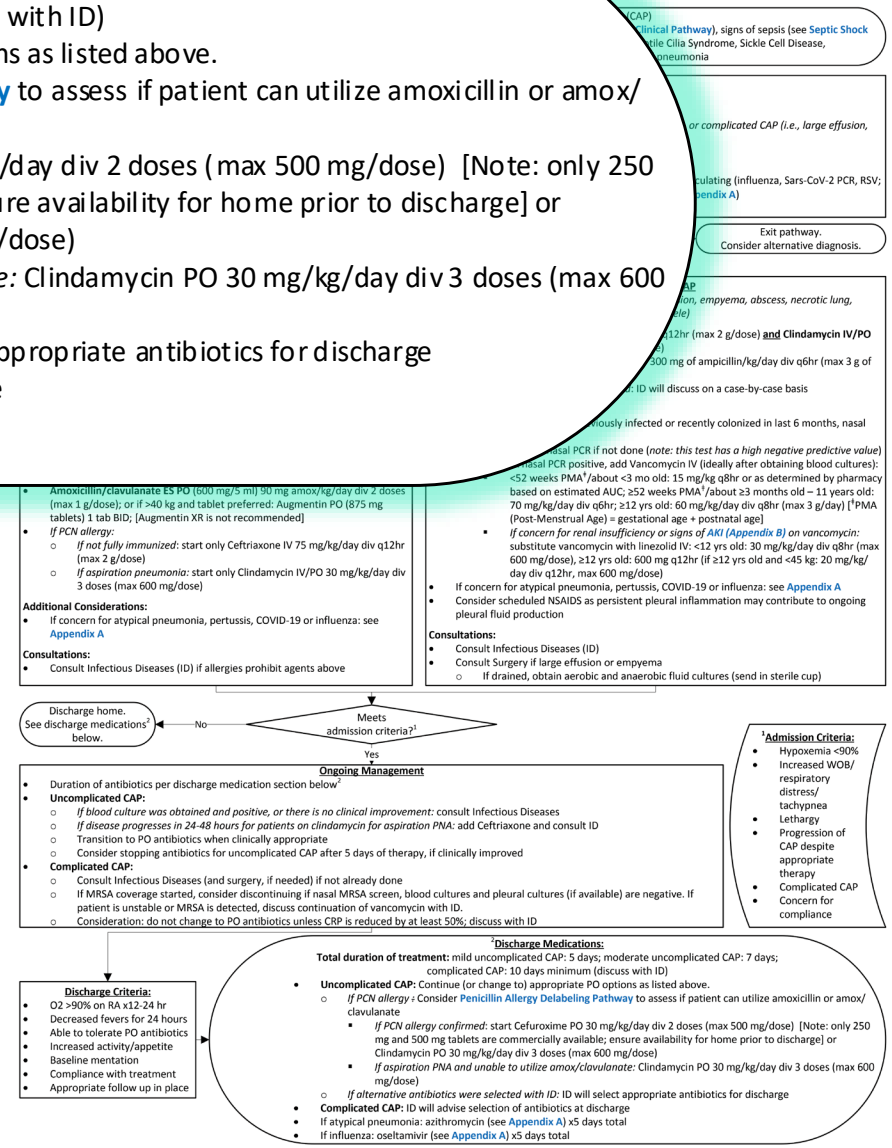
**Total duration of treatment:** mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 7 days; complicated CAP: 10 days minimum (discuss with ID)

- **Uncomplicated CAP:** Continue (or change to) appropriate PO options as listed above.
  - *If PCN allergy :* Consider **Penicillin Allergy Delabeling Pathway** to assess if patient can utilize amoxicillin or amox/clavulanate
    - *If PCN allergy confirmed*: start Cefuroxime PO 30 mg/kg/day div 2 doses (max 500 mg/dose) [Note: only 250 mg and 500 mg tablets are commercially available; ensure availability for home prior to discharge] or Clindamycin PO 30 mg/kg/day div 3 doses (max 600 mg/dose)
    - *If aspiration PNA and unable to utilize amox/clavulanate:* Clindamycin PO 30 mg/kg/day div 3 doses (max 600 mg/dose)
  - *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 Medications

### Complicated CAP antibiotics

- ID should be consulted on 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




**CONTACTS:** IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

LAST UPDATED: 07.10.25

# 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
- Reported penicillin allergy should be further evaluated
  - See Penicillin Allergy Delabeling Clinical Pathway
- 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 treatment should include additional anaerobic coverage
- Shorter duration of antibiotic courses are recommended

# Quality Metrics

- Percentage of patients with CAP with use of CAP pathway order set
- Percentage of patients with CAP with appropriate antibiotic selection per pathway (inpatient and discharge)
- Percentage of patients with CAP correct antibiotic dosage per pathway (inpatient and discharge)
- Percentage of patients with CAP who receive amoxicillin/ampicillin in the Emergency Department
- Average duration of antibiotic course (days)
- Percentage of patients with CAP with negative nasal MRSA PCR and vancomycin or linezolid discontinued within 24 hours of negative result
- Percentage of patients with uncomplicated CPA who have a blood culture performed
- ALOS (days)

*Note: Data is stratified when applicable to complicated, uncomplicated, ED Treat/Release.*

# 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

# References


- American Association for Thoracic Surgery. (2017). *The American Association for Thoracic Surgery consensus guidelines for the management of empyema.* The American Association for Thoracic Surgery. 153:e129-46. DOI:10.1016/j.jtcvs.2017.01.030.
- Balk, D.S., Lee, C., Schafer, J., Welwarth, J., Hardin, J., Novack, V., Yarza, S., Hoffmann, B. (2017). Lung ultrasound compared to chest X-ray for diagnosis of pediatric pneumonia: A meta-analysis. *Pediatric Pulmonology.* 53:1130-1139. DOI: 10.1002/ppul.24020.
- Biondi, E., McCulloh, R., Alverson, B., Klein, A., Dixon, A., Ralston, S. (2014). Treatment of Mycoplasma Pneumonia: A Systematic Review. *Pediatrics.* 133(5):1081-1090. DOI:10.1542/peds.2013-3729.
- Bradley, J.S., Cyington, C., Shah, S.S., et al. (2011). The Management of Community-Acquired Pneumonia in Infants and Children Older Than 3 Months of Age: Clinical Pratice Guidelines by the Pediatric Infectious Diseases Society and the Infectious Diseases Society of America. *Clinical Infectious Diseases.* 53(7):e25-e76. DOI: 10.1093/cid.cir531.
- Carpenter AE, Hofto ME. Clinical progress note: Update in management in community acquired pneumonia in children. J Hosp Med. 2023 Sep;18(9):837-840. doi: 10.1002/jhm.13174. Epub 2023 Jul 26. PMID: 37496190.
- Crawford, L., Pertsovskaya, V., Zhang, A., Hamdy, R. (2023). The MRSA PCR Nasal Swab: A Tool for Antimicrobial Stewardship in Critically Ill Pediatric Patients. *Critical Care Medicine.* 51(1): p 3. DOI: 10.1097/01.ccm.0000905900.00552.28.
- Dangerfield, B., Chung, A., Webb, B., Seville, M.T. (2014). Predictive Value of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Nasal Swab PCR Assay for MRSA Pneumonia. *Antimicrobial Agents and Chemotherapy.* 58(2): 859-864. DOI: 10.1128/AAC.01805-13.
- Daulat, S., Solensky, R., Earl, H.S., Casey, W., Gruchalla, R.S. (2004). Safety of cephalosporin administration to patients with histories of penicillin allergy. *The Journal of Allergy and Clinical Immunology.* 113(6):1220-2. DOI: 10.1016/j.jaci.2004.03.023.
- Florin, T.A., Gerber, J.S. (2020). Sticking by an Imperfect Standard: Chest Radiography for Pediatric Community-Acqruied Pneumonia. *Pediatrics.* 145(3):e20193900. DOI: 10.1542/peds.2019-3900.
- Geanacopoulos, A., Porter, J.J., Monuteaux, M.C., Lipsett, S.C., Neuman, M.I. (2019). Trends in Chest Radiographs for Pneumonia in Emergency Departments. *Pediatrics.* 145(3):e20192816. DOI: 10.1542/peds.2019-2816.
- Gilsdorf, J.R. (2021). Hib Vaccines: Their Impact on *Haemophilus influenza* Type b Disease. *The Journal of Infectious Diseases.* 224(S4):S321-30.
- Goodman, E.J., Morgan, M.J., Johnson, P.A., Nichols, B.A., Denk, N., Gold, B.B. (2001). Cephalosporins can be given to penicillin-allergic patients who do not exhibit an anaphylactic response. *Journal of Clinical Anesthesia.* 13(8):561-4. DOI: 10.1016/s0952-8180(01)00329-4.

# References


- Griffiths, U.K., Clark, A., Gessner, B., Sanderson, C., Sedyaningsih, E.R., Mulholland, K.E. (2012). Dose-specific efficacy of *Haemophilus influenza* type b conjugate vaccines: a systematic review and meta-analysis of controlled clinical trials. *Epidemiology and Infection*. 140(8): 1343-1355. DOI: 10.1017/S0950268812000957.
- Hammond, J.M., Potgieter, P.D., Hanslo, D., Scott, H., Roditi, D. (1995). The Etiology and Antimicrobial Susceptibility Patterns of Mircroorganisms in Acute Community-Acquired Lung Abscess. *Clinical Investigations: Infection.* 108(4): 937-941. DOI: 10.1378/chest.108.4.937
- Kok HC, Chang AB, Fong SM, McCallum GB, Yerkovich ST, Grimwood K. Antibiotics for Paediatric Community-Acquired Pneumonia: What is the Optimal Course Duration? Paediatr Drugs. 2025 May;27(3):261-272. doi: 10.1007/s40272-024-00680-4. Epub 2025 Jan 23. PMID: 39847251; PMCID: PMC12031807.
- Labanderia-Rey, M., Couzon, F., Boisset, S., Brown, E.L., et al. (2007). *Staphylococcus aureus* Panton Valentine Leukocidin Causes Necrotizing Pneumonia. *Science Express*. DOI: 10.1126/science.1137165.
- Perez-Lopez, A., Irwin, A., Rodrigo, C., Prat-Aymerich, C. (2021). Role of C reactive protein and procalcitonin in the diagnosis of lower respiratory tract infection in children in the outpatient setting. *BMJ.* 373:n1409. DOI: 10.1136/bmj.n1409.
- Pernica, J.M., Harman, S., Kam, A.J., Carciumaru, R., Vanniyasingam, T., et al. (2021). Short-Course Antimicrobial Therapy for Pediatric Community-Acquired Pneumonia: the SAFER Randomized Clinical Trial. *JAMA Pediatrics.* 175(5):475-482. DOI: 10.1001/jamapediatrics.2020.6735.
- Rueda, Z.V., Aguilar, Y., Maya, M.A., Lopez, L. et al. (2022). Etiology and the challenge of diagnostic testing of community-acquired pneumonia in children and adolescents. *BMC Pediatrics.* 22:169. DOI: 10.1186/s12887-022-03235-z.
- Same, R.G., Amoah, J., Hsu, A.J., Hersh, A.L. et al. (2021). The Association of Antibiotic Duration With Successful Treatment of Community-Acquired Pneumonia in Children. *Journal of Pediatric Infectious Diseases Society.* 10(3):267-273. DOI: 10.1093/jpids/piaa055.
- Suzuki, J., Sasabuchi, Y., Hatakeyama, S., Matsui, H. et al. (2022). Additional effect of azithromycin over B-lactam alone for severe community-acquired pneumonia-associated acute respiratory distress syndrome: a retrospective cohort study. *Pneumonia*. 14:1. DOI: 10.1186/s41479-021-00093-8.
- Vardakas, K.Z., Matthaiou, D.K., Falagas, M.E. (2009). Incidence, characteristics and outcomes of patients with severe community-acquired MRSA pneumonia. *European Respiratory Journal.* 34:1148-1158. DOI: 10.1183/09031936.0041009.
- Williams, D., Creech, C.B., Walter, E.B., Martin, J., Gerber, J., Newland, J., et al. (2020). Randomized Double-blind Controlled Trial of Short vs. Standard Course Outpatient Therapy of Community Acquired Pneumonia in Children (SCOUT-CAP). *Open Forum Infectious Diseases.* 7(Suppl 1): S216. DOI: 10.1093/ofid/ofaa439.485.
- Williams, D.J., Edwards, K.M., Self, W.H., Zhu, Y., Arnold, S.R., McCullers, J.A., et al. (2017). Effectiveness of B-Lactam Monotherapy vs Macrolide Combination Therapy for Children Hospitalized with Pneumonia. *JAMA Pediatrics.* 171(12):1184-1191. DOI: 10.1001/jamapediatrics.2017.3225.

# 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.