Clinical Pathway: Community Acquired Pneumonia, ED and Inpatient, Pathway

Last updated: 12/16/21

Clinical algorithm:

Patient presents with suspected pneumonia

Make the appropriate diagnosis

Most patients presenting to the Emergency Department are classified as CAP patients

HCAP is no longer a recommended diagnosis.

CAP: Pneumonia acquired outside the hospital setting. Excluding patients with inherited/acquired immune deficiency, drug induced neutropenia, active chemotherapy, HIV with low CD4 counts, BMT/Transplant patients, severe structural lung disease

HAP: Pneumonia NOT present at the time of admission AND occurring 48 hours or more after admission

Aspiration: Suspected aspiration pneumonia does not require routine use of anaerobic antimicrobial coverage and can be treated as community acquired pneumonia unless empyema or cavitary pneumonia is present

Determine Disposition

- Consider PSI Score
- For patients with suspected pleural infection, admission is strongly recommended

Hospital at Home → Hospital At Home Criteria Coming January 2022

Discharge to Home → **Choose antibiotic for patient discharging to home**

- Evaluate risk for resistant organisms (DRIP score)
- Utilize "CAP simple discharge" or "CAP complex discharge"

Admission

Evaluation of recurrent of persistent pneumonia: Consider Alternate Diagnosis

Determine Pneumonia Severity (Table 1)
Evaluate risk for resistant organisms (DRIP score)
Utilize Pneumonia Orderset (Admitting team)

- Choose the appropriate initial antibiotic therapy
- Evaluate listed Penicillin or Cephalosporin Allergies
- Determine additional diagnostic workup

Suspected Pleural Space Infection (refer to Pleural Infection Management Guideline)

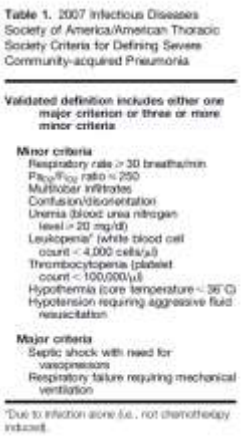


Table 1. 2007 Infectious Diseases Society of America/American Thoracic Society Criteria for Defining Severe Community-acquired Pneumonia

Validated definition includes either one major criterion or three or more minor criteria

Minor criteria
- Respiratory rate ≥ 30 breaths/min
- Pa_{O_2}/F_{IO_2} ratio ≤ 250
- Multilobar infiltrates
- Confusion/disorientation
- Uremia (blood urea nitrogen level ≥ 20 mg/dl)
- Leukopenia* (white blood cell count < 4,000 cells/μl)
- Thrombocytopenia (platelet count < 100,000/μl)
- Hypothermia (core temperature < 36°C)
- Hypotension requiring aggressive fluid resuscitation

Major criteria
- Septic shock with need for vasopressors
- Respiratory failure requiring mechanical ventilation

*Due to infection alone (i.e., not chemotherapy induced).

Antibiotic Time Out

- 48-72 hours after admission
- Review diagnosis and workup
- De-escalate broad spectrum antibiotics
- If questions, contact antimicrobial stewardship pharmacy team vis PS (Derek Vanderhorst, Don Scott)

Transition to Oral Antibiotics

If patient has a persistent oxygen requirement above baseline consult pulmonary rehab for home oxygen assessment no more than 24 hours before discharge

Discharge Recommendations

- Utilize the pneumonia discharge order set
- Ensure the appropriate TOTAL duration of therapy at the time of discharge: 5 days for appropriate patients
- Review imaging from the patients hospitalization. Routine follow-up imaging is not required unless recommended by radiology or specialty teams.
- Consider placing referral to allergy for patients with listed PCN allergies

Clinical pathway summary

CLINICAL PATHWAY NAME: Community Acquired Pneumonia

PATIENT POPULATION AND DIAGNOSIS: Patients 18+ years old diagnosed with Community Acquired Pneumonia in the ED or Inpatient setting.

APPLICABLE TO: All Emergency Departments and Inpatient Hospitals.

BRIEF DESCRIPTION:

The CAP clinical pathway presents the most up to date and evidence-based recommendations for the management of pneumonia in adults in the emergency department and inpatient settings.

TEAM LEADER(S): Dr. Stephanie Burdick, Dr. Liam Sullivan, Dr. Charles Sierzant, Dr. Cheryl Peavler, Dr. John Egan, Derek VanderHorst

OWNING EXPERT IMPROVEMENT TEAM (EIT): Community Acquired Pneumonia

MANAGING CLINICAL PRACTICE COUNCIL (CPC): Acute Health CPC

CPC APPROVAL DATE: November 23, 2021

OTHER TEAM(S) IMPACTED: ED, Hospitalist, Pulmonary, Pharmacy

OPTIMIZED EPIC ELEMENTS:

UPDATED ED and Admission Ordersets
Remove B lactam allergy alerts
Sidebar Summary includes number of days of antibiotics already received.
NEW CAP General Discharge Orderset including patient education

IMPLEMENTATION DATE: December 2021

LAST REVISED: November 2021

FOR MORE INFORMATION, CONTACT: Stephanie Burdick

Clinical pathway clinical approach

TREATMENT AND MANAGEMENT:

Definitions:

Community acquired pneumonia:
This is defined as pneumonia that is acquired outside the hospital setting. This definition **does not** include:

- -Patients with inherited or acquired immune deficiency
- -Patients with drug induced neutropenia
- -Patients on active chemotherapy
- -Patients with HIV and low CD4 cell counts
- -Bone Marrow transplant patients.
- -Patients with severe structural lung disease

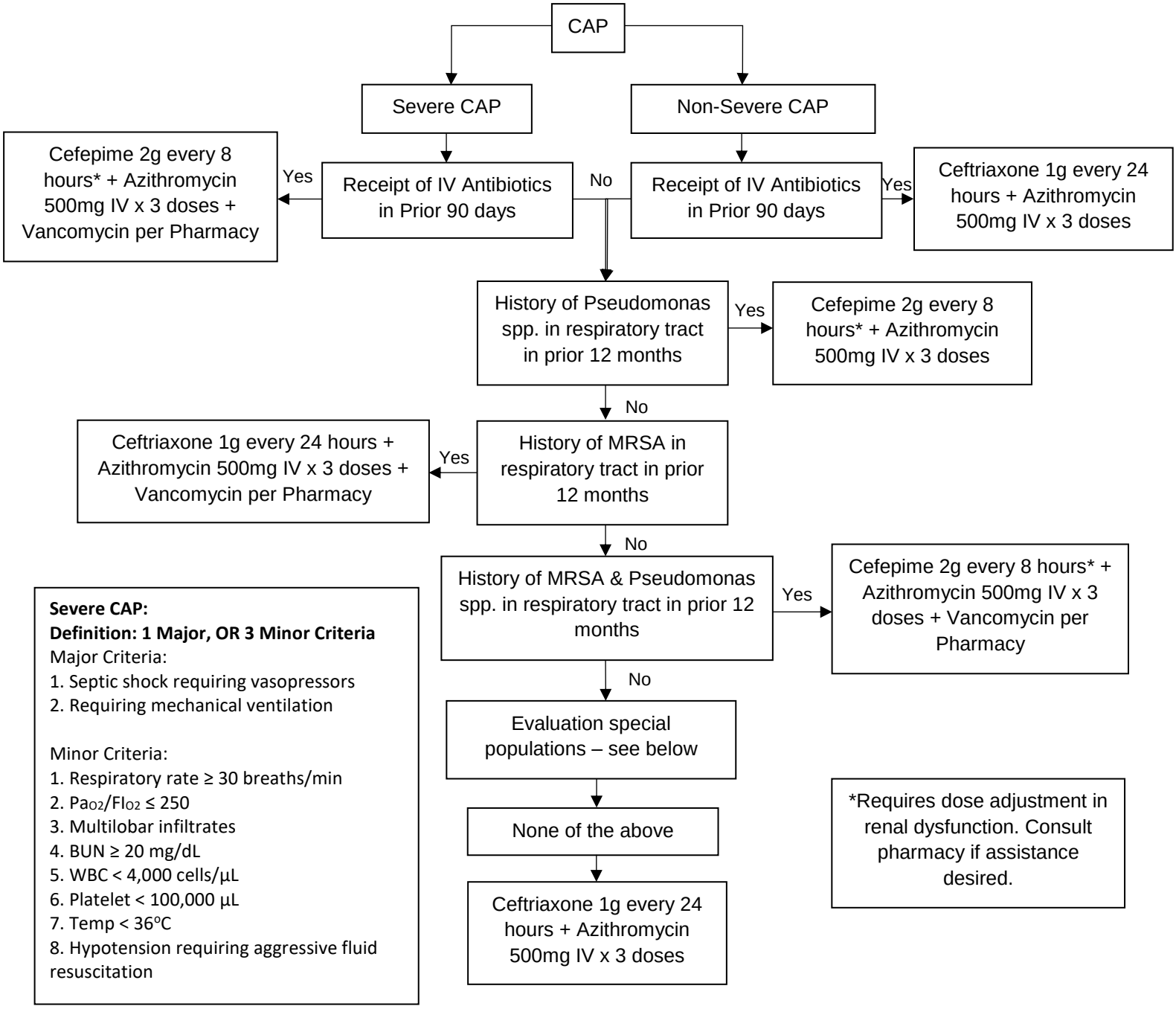
Hospital acquired pneumonia:
This is defined as pneumonia that develops > 48 hours or more after admission and was NOT present at the time of admission

Aspiration pneumonia:
Refers to pneumonia that develops because of aspiration of fluid, particulate exogenous substances, or endogenous secretions into the lower airways (up to date). Please note that suspected aspiration pneumonia does not need the use of anaerobic antimicrobial coverage and can be treated as community acquired pneumonia unless empyema or cavitary pneumonia is present.

PSI score:
PSI stands for Pneumonia Severity Index and this score helps to estimate the probability of morbidity and mortality in patients with community acquired pneumonia. The goal of this score is to help physicians with decisions about hospitalization for patients with pneumonia. It is a scoring system that groups patients into five categories that can be used to predict 30-day mortality. This calculator utilizes age, presence of co morbidities, physical exam findings, among other things.
Generally, patients in risk group I-III are at low risk of death and other adverse medical outcomes and can be considered for outpatient management or an abbreviated course of inpatient management. [3]
In comparison to the PSI, there is less evidence that CURB-65 is effective as a decision aid in guiding the initial site of treatment[2].

DRIP score:
The DRIP score is a clinical prediction score with an improved ability to predict the risk of pneumonia due to drug-resistant pathogens. It stands for Drug resistance in pneumonia prediction score. The drip score includes major and minor characteristics. Each major characteristic accounts for two points and they include; antibiotic use within the last sixty days; Residence in a long term care facility; tube feeding and prior infection with a Drug resistant pathogen in the last year*. Minor characteristics account for one point each and they include hospitalization within the last 60 days; chronic pulmonary disease; poor functional status; Gastric acid suppression; wound care and MRSA colonization. The goal of using the DRIP scoring system is to decrease antibiotic overutilization in patients with pneumonia.
A DRIP score of >/=4 predicts high probability of pneumonia caused by a drug resistant pathogen. This threshold is fulfilled by the presence of either 2 major risk factors, 1 major risk factor plus 2 minor risk factors, or 4 minor risk factors[6].

CAP initial antibiotic algorithm



Antibiotic Pocket Card for CAP (HMS)

Throughout the stay, review the need for antibiotics using the Antibiotic Timeout Checklist (HMS).

Severe community acquired pneumonia:
According to the 2007 infectious diseases society of America and the American Thoracic society criteria for defining CAP. Severe CAP is defined as having one major criterion or at least three minor criteria (see table). The major criteria include patients requiring ICU level care which includes patient with septic shock requiring vasopressors and patients with respiratory failure requiring mechanical ventilator. Minor criteria include respiratory rate >/= 30; PaO2 to FiO2 ratio </=250; multilobular infiltrates, Confusion/disorientation, Uremia (>/= 20mg/dl); Leukopenia (<4000cells/uL), thrombocytopenia (<100,000/uL); hypothermia with core temperature < 36C; Hypotension requiring aggressive fluid resuscitation.

When to use corticosteroids:

a. The guidelines do not recommend routine use of corticosteroids in adults with non-severe, severe CAP or in patients with severe influenza pneumonia.
b. Surviving sepsis guidelines should be followed however in patients with CAP and refractory septic shock[2].

When to include anaerobic coverage:
Anaerobic coverage is no longer recommended for patients with pneumonia due to aspiration. Consider anaerobic coverage in patients with empyema, lung abscess, complicated parapneumonic effusion, necrotizing/cavitary pneumonia, post obstructive pneumonia.

How long to treat CAP:
This depends on if the patient's pneumonia is complicated or not. (See above for definitions of complicated pneumonia.)

a. Uncomplicated CAP
    a. 5 days if patient is afebrile for 48 hours and has no more than 1 sign of clinical instability by day 5 of treatment.
b. Complicated CAP
    a. 7 days if the patient is afebrile for 48 hours and has no more than one sign of clinical instability by day 7 of treatment. Please note that Azithromycin duration should not be more than 5 days.
    b. Therapy can be continued for patients who are febrile or clinically unstable on day 7 of treatment

    **Signs of clinical instability includes:
        - Oxygen requirement less than 90% or new oxygen requirement.
        - HR >100bpm
        - RR> 24
        - Systolic blood pressure <90
        - Altered mental status (or different from baseline)[7].

CAP Special Populations	
Necrotizing and/or Cavitary Infiltrates	Empiric therapy: Ampicillin-sulbactam 3g every 6 hours* + Vancomycin Pharmacy to Dose Consider Pulmonary or Infectious Diseases consult
Influenza-like illness or COVID-19 in prior 30 days	Ceftriaxone 1g every 24 hours + IV Vancomycin per Pharmacy
QTc ≥ 500msec	Avoid Azithromycin & Levofloxacin. Consider Doxycycline for atypical coverage as needed
Penicillin Allergy	Patients with reported type 1, IgE mediated hypersensitivities, can tolerate 3rd & 4th generation cephalosporins. A listed penicillin allergy is not a contraindication to receiving a cephalosporin.
Cephalosporin Allergy	If listed allergy is non-severe and from a medication of a different group in Table 2 below, the risk of cross-reactivity is low and the medication may be used. If truly unable to give Ceftriaxone, consider Levofloxacin 750mg daily*
Legionella Pneumonia	Levofloxacin 750mg every 24 hours* Consider Pulmonary or Infectious Diseases consult

Cephalosporin Drugs with Identical or Similar R1 Side-Chain Structures

1. Find the cephalosporin(s) the patient reacted to and avoid all cephalosporins in that same group.
2. Give full strength dose of a cephalosporin from a different group

R1 Side Chain Group	**Cephalosporin (generation)**	
	Oral/Enteral	**IV/Parenteral**
Group 1	Cephalexin (1st) Cefaclor (2nd)	
Group 2	Cefprozil (2nd)	
Group 3	Cefdinir (3rd)	
Group 4	Cefixime (3rd) Cefpodoxime (3rd)	Cefepime (4th) Cefotaxime (3rd) Ceftriaxone (3rd) Ceftazidime (3rd)
Group 5		Cefoxitin (2nd)
Group 6		Ceftaroline (5th)
Group 7		Cefazolin (1st)
Group 8	Cefuroxime (2nd)	Cefuroxime (2nd) Cefotetan (2nd)

Additional diagnostic work up for Community Acquired Pneumonia (CAP)

Blood Cultures

- NOT routinely recommended for hospitalized CAP patients & are only recommended in the following situations:
    - Severe CAP
    - Empiric treatment for MRSA/Pseudomonas or have previous history of MRSA/Pseudomonas pneumonia
    - Hospitalization and/or receipt of IV antibiotics within preceding 90 days

Respiratory Cultures

- Obtain in all cases of:
    - Severe CAP
    - Empiric treatment of MRSA/Pseudomonas or have previous history of MRSA/Pseudomonas
    - Hospitalization and/or receipt of IV antibiotics within last 90 days
- Consider obtaining cultures in non-severe cases of CAP in patients with significant sputum production

Urinary Antigen Testing

- Consider urine antigen testing for Streptococcus pneumoniae all CAP cases but it is NOT routinely recommended
- Legionella urine antigen should be obtained in ALL CAP admissions

Viral Respiratory Panel

- Routine testing for influenza is recommended during influenza season
- Routine testing for COVID-19 is recommended:
    - During periods of high community COVID-19 transmission
    - Any patient with compatible clinical illness or recent high risk exposure
- Consider testing for other respiratory pathogens (e.g. RSV, Adenovirus, Parainfluenza virus, etc) in patients with compatible clinical illness or recent exposures

Procalcitonin testing

- Routine procalcitonin testing of CAP admissions is NOT recommended
- Use of procalcitonin testing to assist with antibiotic decisions should only be done in conjunction with other diagnostic testing as studies have demonstrated that antibiotics should not be withheld based procalcitonin testing alone

Oral stepdown therapy

Typical Bacterial Coverage	Preferred	Cefuroxime 500mg twice daily* OR Amoxicillin/Clavulanate 2g/125mg twice daily$^{\Sigma}$* $^{\Sigma}$Amoxicillin/Clavulanate 875mg/125mg twice daily* acceptable for patients unable to tolerate higher dose
	Alternatives	Only patients without comorbidities: Amoxicillin 1g three times daily* Patients with comorbidities unable to tolerate preferred therapies: Cefdinir 300mg twice daily* OR Levofloxacin 750mg daily*
Atypical Coverage	Preferred	Azithromycin 250mg daily$^{¥}$ OR Doxycycline 100mg twice daily $^{¥}$IV Azithromycin 500mg daily x3 days is a sufficient course for most atypical pneumonia. Patients that have received this in the hospital do not need additional therapy at discharge. If patients have not received any Azithromycin: 500mg once, followed by 250mg daily x 4 days
	Alternatives	Levofloxacin 750mg daily*

*Requires dose adjustment in renal dysfunction

Recurrent and non-resolving pneumonia

- **Anatomic abnormality**
  - Recurrent or unresolving pneumonia in same lobe of lung e.g. RML
    - Anatomic abnormality such as bronchial stenosis
    - Extrinsic compression of the airway from tumor, vascular abnormality, mediastinal adenopathy
    - Retained foreign body
    - Tracheobronchial fistula
    - Bronchial sequestration or congenital cyst
  - Workup should include CT imaging, pulmonary consultation, consideration for bronchoscopy to evaluate airways, perform biopsies, or remove foreign body.
- **Systemic process or atypical infection**
  - Recurrent or unresolving pneumonia in multiple lobes
    - Atypical infection such at MTB, NTM, or fungiàserologic testing and lavage or lung biopsies to obtain more culture material.
    - Immunodeficiency (often associated with infections throughout the body) either acquired or congenital (Patient with history of lung transplant or malignancy on therapy vs immunoglobulin deficiencyàmalignancy workup, immunoglobulin testing, HIV testing, bronchoscopy with BAL
    - Autoimmune process such as organizing pneumonia, diffuse alveolar hemorrhage, ANCA + pulmonary vasculitis, acute flare of ILDàSerologic testing including ANA, ANCA, RF, PR3, MPO. Bronchoscopy with serial lavage for DAH versus transbronchial biopsies for organizing pneumonia. Consideration for surgical lung biopsies if ILD suspected.
    - Aspiration pneumonitis/pneumonia secondary to swallow dysfunction, severe GERD, altered mental status secondary to drug overdose, Zenker's diverticulum. Speech and swallow evaluation. Barium swallow. GI evaluation.
    - Bronchiectasis with recurrent flares or pneumonia. Acquired bronchiectasis from previous infections or therapies such as radiation therapy. Congenital bronchiectasis secondary to CF and primary ciliary dyskinesia. Sinus biopsy. CF testing.

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