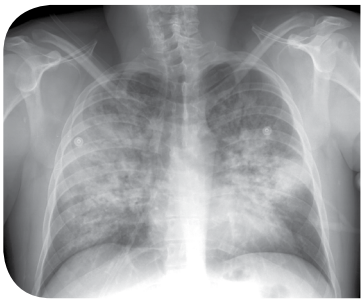


Diagnosis and Management of

Community-Acquired Pneumonia in Adults

2024 Update

Intermountain Canyons and Desert Regions

This evidence-based Care Process Model has been developed by a multidisciplinary team at Intermountain Health consisting of representatives from Pulmonary, Infectious Disease, and Antibiotic Stewardship. Based on national guidelines, it can serve to guide Emergency Departments and Clinics in diagnosis, risk assessment, and treatment of community-acquired pneumonia in adults.

Key Points

Imaging improves the accuracy of pneumonia diagnosis.

- In addition to physical exam and clinical judgement, imaging such as X-ray, ultrasonography, or CT should be used to confirm pneumonia diagnosis.

Using objective severity-of-illness criteria to guide site-of-care decisions improves patient outcomes.

- Research indicates that use of objective tools such as CURB-65, eCURB, Intermountain's ePneumonia tool, or SpO_2% improves identification of patients that can safely be managed as an outpatient.

Improving antibiotic stewardship minimizes harm.

- Use an assessment of clinical stability to guide antibiotic duration for inpatient care. National guidelines recommend that some individuals may receive as few as 3 days of antibiotic treatment.
- Confirm the presence and severity of a patient's penicillin allergy before limiting the use of the penicillin family.
- Use *Drug Resistance in Pneumonia (DRIP) scoring* to identify patients at risk of MRSA, *Pseudomonas aeruginosa*, or other drug-resistant organism.

Diagnostic stewardship reduces harm and cost.

- Diagnostic tests should be thoughtfully ordered when results and their timing can meaningfully impact clinical care.
- Testing should be guided by severity of illness, location of care, and risk factors for atypical or unusual pathogens. See *Best Practices: CAP; AHRQ.*
- Intermountain's ePneumonia tool and associated powerplans provide specific recommendations for appropriate testing and timing. Considered testing in CAP include: blood cultures, sputum cultures, urinary antigens, and respiratory and pneumonia panels.

What's New in this update?

- Duration of antibiotics in clinically stable CAP patients can be shortened to 3 days.
- Consider corticosteroid use in patients with CRP ≥15 mg/dL and severe hypoxia (≥50% O_2 requirement or positive pressure ventilation).

What's inside?

Intermountain Measures

- Utilization of ePneumonia clinical decision support
- Antibiotics used in pneumonia treatment of adults
- Duration of antibiotic therapy (inpatient and outpatient)
- Pneumonia mortality rates

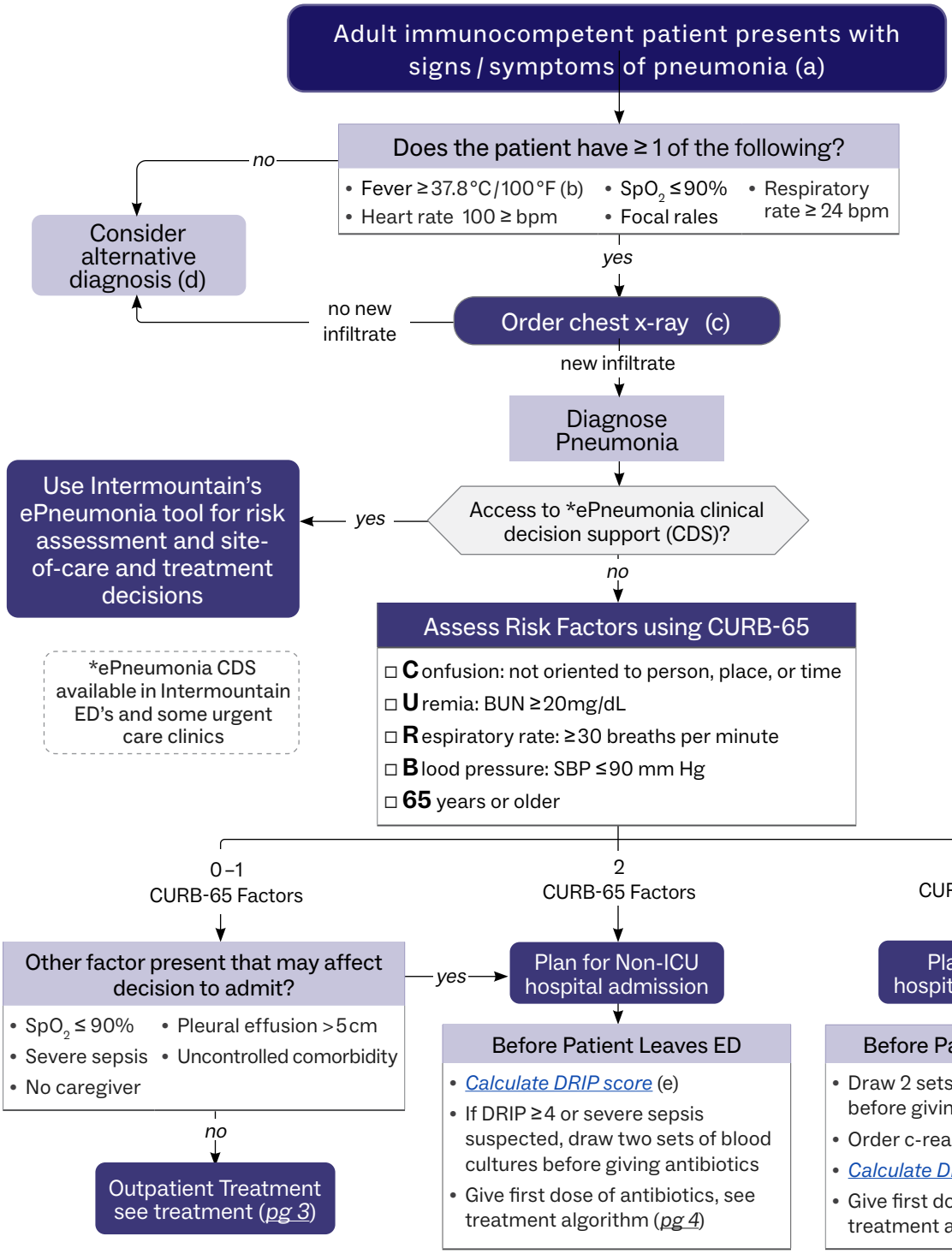
Supporting Evidence

Diagnosis and Treatment of Adults with Community-acquired Pneumonia. ATS/IDSA 2019

Best Practices in Diagnosis, Treatment of Community-Associated Lower Respiratory Tract conditions (AHRQ)

Intermountain Health

Diagnosis and Risk Assessment of CAP in adults



(a) Signs / symptoms

- Fatigue 91%
- Chills 73%
- Cough 86%
- Dyspnea 72%
- Fever 74%
- Anorexia 71%
- Sweats 69%
- Pleuritic chest pain 46%
- Hemoptysis 16%
- Headache 58%
- Vomiting 25%
- Myalgia 51%
- Abdominal pain 16%

In elderly, confusion is more common; fever, chills, sweats, headache, and myalgia less common.

(b) Fever

During influenza season, fever alone may not require chest x-ray if no other signs or symptoms of pneumonia are present.

(c) Chest X-ray (CXR)

Either a positive CXR or CT scan is required to make the diagnosis per international guidelines. However,not all with new radiographic shadow, cough, fever, and leukocytosis has CAP. Conversely, a negative x-ray is rarely followed by a positive film. If suspect pneumonia despite negative x-ray, begin treatment and repeat the x-ray in ~ 2 days

(d) Alternative diagnoses

- Influenza
- Acute bronchitis
- Acute exacerbation of chronic bronchitis
- Aspiration pneumonitis
- Hypersensitivity pneumonitis
- Lung cancer
- Heart failure
- COVID
- Pulmonary embolism (with infarction)
- Pneumocystis, tuberculosis
- Hantavirus
- Sepsis with acute lung injury
- Travel-related infection
- Pertussis

(e) Drug Resistance In Pneumonia (DRIP)

DRIP scoring identifies patients at risk for infection with MRSA, Pseudomonas, and other bacteria resistant to usual CAP therapy.

To calculate the DRIP score for a patient, sum the points for applicable risk factors shown in the table at right. A score ≥ 4 indicates an increased risk of drug-resistant pneumonia.

	DRIP Risk Factors	Points
Major	• Antibiotic use < 60 days • Long-term care resident • Tube feeding • Drug-resistant pneumonia < 1 year	2 pts each
Minor	• Hospitalization < 60 days • Chronic pulmonary disease • Poor functional status • Gastric acid suppression • Wound care • MRSA colonization < 1 year	1 pt each

Outpatient Treatment of CAP in Adults

Pneumonia Patient - Outpatient

Previously healthy AND no antimicrobial use in last 3 months

Comorbidities (COPD, CHF, diabetes, renal failure, malignancy etc.) OR antimicrobial use in last three months

Mild Pneumonia Antibiotics

Choose ONE of the following	
Doxycyline*	100 mg orally twice daily for 5 days
Amoxicillin	1000 mg 3 times daily for 5 days

*If pregnant or allergic to doxycyline, use azithromycin/amoxicillin regimen

Moderate Pneumonia Antibiotics

Choose ONE of the Following	
Doxycycline	100 mg orally twice daily for 5 days
Azithromycin	500 mg orally once daily for 3 days
PLUS	
Ceftriaxone	1 g IV or IM daily until stable
then	
Amoxicillin	1000 mg 3 times daily for 5 days

*If pregnant or allergic to doxycyline, use azithromycin

Other outpatient best practices

- ☐ Give patient education describing signs/symptoms that would indicate a need to call or return for further treatment.
- ☐ Follow-up visit or phone call in 48 to 72 hours
- ☐ Follow-up visit in 6 weeks
  - – No routine radiographic follow up is recommended after treatment except in patient who meet criteria for lung cancer screening among current or past smokers
  - – Give influenza, COVID-19, and pneumococcal vaccines if needed (see vaccines below)
- ☐ Provide smoking cessation advice or counseling see *Quitting Tobacco: your journey to freedom* for resources.

Notes on Vaccinations

All patients should be screened for the need for influenza (during respiratory season) as well as COVID-19 and pneumococcal vaccines at outpatient clinic visits or before discharge (if hospitalized).

- **Influenza:** Annual influenza vaccination *(ACIP recommendations)*
- **COVID-19:** *ACIP COVID-19 Vaccine Recommendations*
- **Pneumococcal vaccines:** Eligible adults include all patients ≥ 65 and those 19 to 64 that have *chronic medical or immunocompromising conditions* who haven't completed a pneumococcal series. For details on *pneumococcal vaccine series* see page 5.

Vaccination is recommended if vaccination status is unknown.

Influenza pneumococcal and COVID-19 vaccines can be given simultaneously, but should be given at separate site.

Vaccines can be given in mild disease with or without fever or in convalescence phase of an illness however, moderate-to-severe acute illness with or without fever is a precaution for all vaccines.

Notes on antibiotic dosing

Quinolones (e.g. levofloxacin) should not be used as first-line therapy in CAP.

- Adverse events (tendonitis/rupture, aorta tears, peripheral neuropathology, prolonged QT, low blood sugar, exacerbation of myasthenia gravis, mental health side effects and renal/hematologic/hepatic toxicities).
- Increased risk of *C. difficile.* (See C.diff CPM)
- If used, recommended dose of levofloxacin 750 mg for 5 days. Adjust subsequent doses if creatine clearance <30 mL/min.

Macrolide monotherapy NOT recommended.

- Resistance of *S. pneumoniae* (most common/deadly cause of CAP) is >20% in Utah.

Confirm penicillin allergy before avoiding amoxicillin.

- Up to 9/10 patients with stated penicillin allergies are not true allergies when investigated.
- Question patient as to timing and type of reaction and consider oral challenge when applicable.

Use generic first-line antibiotics when possible.

Inpatient Treatment of CAP in Adults

Pneumonia patient Non-ICU

If not previously done

- Calculate *DRIP score* (see *pg 2*) †
- If DRIP ≥ 4 draw two sets of blood cultures and order nasal MRSA PCR before giving antibiotics
- DO NOT wait for culture results before starting antibiotics

Non-ICU Antibiotics†

Ceftriaxone then **Amoxicillin**	1g IV or IM daily until stable 1000 mg 3 times daily (duration*)
PLUS ONE of the following regimens	
Azithromycin	500 mg daily for 3 days
Doxycyline	100 mg orally twice daily (duration*)

*Determine duration based on algorithm below
† If DRIP score ≥4, consider using vancomycin + azithromycin + either cefepime or piperacillin-tazobactam

Pneumonia patient ICU

If not previously done

- Calculate *DRIP score* (see *pg 2*) †
- Draw two sets of blood cultures and order nasal MRSA PCR before giving antibiotics
- DO NOT wait for culture results before starting antibiotics

ICU Antibiotics†

Ceftriaxone then **Amoxicillin**	1g IV or IM every 12 hours until stable 1000 mg 3 times daily (duration*)
PLUS	
Azithromycin	500 mg daily for 3 days

*Determine duration based on algorithm below
† If DRIP score ≥4, consider using vancomycin + azithromycin + either cefepime or piperacillin-tazobactam

See *Inpatient Treatment of CAP Summary Card*

Consider corticosteroids for patients with CRP ≥15 mg/dL and severe hypoxia (≥50% O_2 requirement or positive pressure ventilation). *See pg 5 for discussion.*

*Determining Total Duration of Antibiotics

Does Patient have ANY complications?

Pneumonia- related	Pathogen-related	Other Infections
• Bacteremia • Cavitation of the lung • Parapneumonic effusion requiring thoracentesis	• Legionella • MRSA • *Pseudomonas aeruginosa* • Rare (mycobacteria, PJP, nocardia, fungi)	• Endocarditis • Meningitis

no → **Does Patient Meet ALL Criteria for Clinical Stability?**

- Heart Rate <100 bpm or baseline
- Systolic Blood Pressure >90 mm Hg
- Temperature >36 °C and <38 °C
- Arterial O_2 Saturation >90% room air OR pO_2 ≥ 60 mmg Hg
- Respiratory Rate <24 bpm
- Mentation at baseline
- Ability to maintain oral intake

yes → **3 day duration**

no → **Has patient been afebrile for 48 hours?**

yes → only 1 sign of instability → **5 day duration**

yes → >1 sign of instability → **Continue antibiotics until patient meets clinical stability**

also consider underlying diagnoses or conditions e.g.

- Uncontrolled source (parapneumo eff. empyema)
- Antibiotic resistance

no → Count inpatient antibiotics as part of total duration

yes → suspected or proven MRSA or *P. aeruginosa* without complicating features → **7 day duration**

yes → other complicating features → **Discuss with ID/Pulmonary**

Other Inpatient Best Practices

- Early ambulation. Have patient sit in chair and/or ambulate for at least 20 minutes during first 24 hours of hospitalization
- VTE prophylaxis
- Provide *smoking cessation*
- Provide *needed vaccines* before discharge

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Pneumococcal Vaccine

- Eligible adults may receive 1 dose of PCV20 for a complete series
- For patients who received PCV15 outside our system, it is recommended to receive PPSV23 ≥1 year(s) later
- Persons who have received PCV13 ONLY, may complete the series wither one dose of CV20 or 1+ (depending on age and risk condition) doses of PPSV23
- The interval between PCV13 or PCV15 and a dose of PPSV23 is one year

Vaccine History	Recommendation
PCV20	Complete
PCV15 + PPSV23	Complete
PPSV23 only	PCV20 ≥ 1 yr after
PCV15 only	PPSV23 ≥ 1 yr after
PCV13 only	PCV20 ≥ 1 yr after
PCV13 any time + PPSV23 < 65	PCV20 ≥ 5 yr after
PCV13 anytime + PPSV23 ≥65	Complete but may + PCV20 ≥ 5 yr

This CPM presents a model of best care based on the best available scientific evidence at the time of publication. It is not a prescription for every physician or every patient, nor does it replace clinical judgment. All statements, protocols, and recommendations herein are viewed as transitory and iterative. Although physicians are encouraged to follow the CPM to help focus on and measure quality, deviations are a means for discovering improvements in patient care and expanding the knowledge base. Send feedback to Whitney Buckel PharmD, Intermountain Healthcare,System Antimicrobial Stewardship Pharmacist Manager (Whitney.Buckel@imail.org)

Corticosteroid Discussion

Although several trials suggest corticosteroids may have a modest effect on progression and time to recovery, data are conflicting about whether corticosteroids convey a mortality benefit. This disagreement is likely due to heterogeneity in both the study populations and corticosteroids chosen in the randomized controlled trials.

The most recent trial by Dequin et al. reported a 5.6% mortality benefit in patients admitted to the intensive care unit with severe pneumonia not complicated by septic shock. Subgroup analyses suggested several populations who might particularly benefit, such as those with CRP ≥ 15 mg/dL, but these have yet to be validated. The regimen used in this trial was hydrocortisone 200 mg daily for 4–7 days. Depending on the response to therapy at day 4 and therafter, a taper was initiated for a total of 8–14 days, with automatic discontinuation at ICU discharge. Potential adverse effects of corticosteroids include hyperglycemia, hypokalemia, and peptic ulceration. Corticosteroid use is not recommended for patients with influenza, active tuberculosis, or fungal infection.

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