

Guideline for the Management of Community-Acquired Pneumonia

DEFINITION:

Community-Acquired Pneumonia (CAP) is pneumonia that occurs within 48 hours of hospital admission or is present on admission to the hospital.

EXECUTIVE SUMMARY: see Appendix A for dosing

Patient not being admitted to the hospital	
<p><u>No comorbidities:</u></p> <ul style="list-style-type: none"> Amoxicillin OR Doxycycline 	<p><u>Comorbidities present:</u></p> <p>Malignancy, alcoholism, asplenia, diabetes, chronic heart/lung/liver/renal disease</p> <ul style="list-style-type: none"> Amoxicillin/clavulanate OR cefuroxime PLUS azithromycin OR doxycycline Severe beta-lactam allergy: Fluoroquinolone (levofloxacin or moxifloxacin)
Patient Admitted to the hospital	
<p><u>Non-Severe:</u></p> <ul style="list-style-type: none"> Ampicillin/Sulbactam OR Ceftriaxone PLUS Azithromycin OR Doxycycline (<i>preferred</i>) Levofloxacin 	<p><u>Severe:</u></p> <p>Septic shock, respiratory failure, or 3 minor criteria See Box 1 below</p> <ul style="list-style-type: none"> Ampicillin/Sulbactam OR Ceftriaxone PLUS azithromycin* (OR levofloxacin) Severe beta-lactam allergy: Levofloxacin
<p>Do not routinely add broad spectrum antibiotics. Evaluate risk factors.</p>	
<ul style="list-style-type: none"> If history of respiratory tract colonization with MRSA, gram-negative rod resistant to CAP agents, OR recent hospital stay with use of IV antibiotics (>5 days) → Obtain sputum culture: <ul style="list-style-type: none"> If culture positive for MRSA consider add Vancomycin or Linezolid If culture positive for Pseudomonas consider use of Piperacillin/tazobactam⁺ OR Cefepime Patients improving on typical CAP therapy do not need to have antibiotics adjusted <div style="border: 1px solid black; padding: 5px; margin-top: 10px; width: fit-content;"> <p>Early transition to oral therapy recommended in non-severe CAP</p> </div>	<ul style="list-style-type: none"> Always obtain respiratory tract diagnostic testing and modify therapy based on results MRSA sputum colonization, post-influenza pneumonia, severe necrotizing pneumonia <ul style="list-style-type: none"> Consider <i>addition</i> of vancomycin or linezolid to typical CAP therapy Resistant gram-negative sputum colonization (Pseudomonas, organisms resistant to typical CAP therapy) <ul style="list-style-type: none"> Consider piperacillin/tazobactam⁺ PLUS azithromycin* OR Cefepime PLUS Azithromycin* Recent hospital stay with use of IV antibiotics (>5 days) <ul style="list-style-type: none"> Consider <i>addition</i> of vancomycin or linezolid PLUS Piperacillin/tazobactam⁺ PLUS azithromycin* OR Cefepime PLUS Azithromycin*

Duration of Therapy 5 days for Most Patients

*Azithromycin preferred. If azithromycin cannot be used, use levofloxacin. If neither levofloxacin nor azithromycin can be used, doxycycline can be substituted.

+Avoid use of vancomycin in combination with piperacillin/tazobactam

PURPOSE:

To provide a framework for the initial evaluation and management of adult patient with bacterial causes of CAP based on recent literature and guidelines. Delays in the initiation of appropriate antibiotic therapy may increase mortality in severely ill patients, and therapy should not be postponed for the purpose of performing diagnostic studies in patients who are clinically unstable. In clinically stable patients with diagnostic uncertainty, antibiotics can be safely withheld while additional work up is underway. Antibiotics should be administered when the diagnosis is considered likely, preferably while the patient is in the emergency department. Pneumonia order sets are available within One Chart, which should be utilized to facilitate guideline compliant care. An Infectious Diseases consult is recommended when dealing with complicated or immunocompromised patients (e.g., hematopoietic stem cell or solid organ transplant). Recommendations regarding the management of immunocompromised pneumonia are provided later in the document (**Table 2 and 3**).

PATIENT DISPOSITION:

The decision of where to care for a patient with pneumonia should be based on clinical judgment taking into consideration age, co-morbid conditions, and factors that may compromise the safety of home care and be supplemented with a clinical decision support tool like the Pneumonia Severity Index (PSI, see Appendix A). The Pneumonia Severity Index has better discriminatory ability to predict mortality than the CURB-65 scoring system. Home care is recommended for risk classes I, II, and III. Patients meeting the severe CAP definition should be admitted to the ICU as they are at high risk for adverse outcomes. Additionally, patients initially admitted to the ward and subsequently transferred to the ICU have increased mortality compared to those admitted directly to the ICU.^{1,2}

Severe CAP can be defined by:^{1,2}

- 1.) Respiratory failure requiring mechanical ventilation OR
- 2.) Septic shock with the need for vasopressors OR
- 3.) The presence of any three minor criteria

Box 1: Minor Criteria of Severe COP (3=ICU)¹

- (1) Respiratory rate ≥ 30 breaths/min
- (2) $PaO_2/FiO_2 < 250$
- (3) Multi-lobar infiltrates
- (4) Confusion/disorientation
- (5) Uremia (BUN ≥ 20)
- (6) Leukopenia (WBC < 4000)
- (7) Thrombocytopenia (platelets $< 100,000$)
- (8) Hypothermia (core temperature $< 36^\circ C$)
- (9) Hypotension requiring aggressive fluid resuscitation.

DIAGNOSTIC TESTING:

All patients thought to have pneumonia should have a chest X-ray and pulse oximetry performed. All admitted patients should have an assessment of gas exchange (oximetry or arterial blood gas), complete blood cell count and differential, and complete metabolic panel. Further diagnostic testing should be guided by severity of illness, location of care, and risk factors for atypical or unusual pathogens.

MICROBIOLOGIC TESTING:

Outpatient CAP: Microbiologic testing is not recommended in patients treated in the outpatient setting unless they have failed therapy or are being treated with expanded therapy for multi-drug resistant organisms (MDROs).

Inpatient CAP: A variety of diagnostic tests exist to define the etiology of pneumonia. These should be used more aggressively in patients with severe pneumonia and those started on broad-spectrum antibiotics targeting MDROs so therapy can be directed towards appropriate pathogens. Sputum cultures should be utilized routinely in patients with severe CAP, patients with risk factors for MDRO isolation, immunocompromised patients, or who have been started on broad-spectrum therapy. Ideally, diagnostic testing should be obtained before antibiotics are begun, but this is not always possible, and therapy should not be delayed if a sputum culture cannot be obtained. HIV screening should be considered, especially for patients aged 15-54 years. Use of the pneumonia panel and COVID-19 testing should be based on current guidance.

Table 1: Diagnostic Testing in CAP

	Inpatient CAP (non-severe)	Severe CAP	Inpatient CAP on MDRO Therapy*	Immunocompromised CAP
Blood Cultures	No ⁺	Yes	Yes	Yes
Sputum Culture or Tracheal Aspirate	If history of sputum MRSA or Resistant GNR OR recent hospitalization with IV antibiotic use >5 days	Yes (coupled with Pneumonia Panel)	Yes	Yes
Urine Antigens (Legionella and Pneumococcus)	No ⁺	If Pneumonia Panel not obtained	If Pneumonia Panel not obtained	If Pneumonia Panel not obtained
Respiratory Pathogen Panel (RPP)**	Only if respiratory virus suspected or to rule out influenza	If Pneumonia Panel not obtained	Only if respiratory virus suspected or to rule out influenza	If Pneumonia Panel not obtained
COVID-19 Testing	Yes	Yes	Yes	Yes
Pneumonia Panel***	No	Yes	Consider	Consider strongly

⁺Can be considered in select cases where pathogen determination is felt to be important

*See risk factors for MDRO below. Examples of MDRO therapy includes use of anti-MRSA antibiotics and antibiotics active against *P. aeruginosa*.

**Pneumonia Panel includes all components of RPP and both should not be used

***See Pneumonia Panel guidance on use

Testing for fungal or mycobacterial pathogens should be considered in patients with presentations suggestive of these etiologies (cavitation, immunosuppression, etc.) or failure to respond to CAP therapy.

MANAGEMENT:

Antibiotic Selection: The categories of pneumonia have been revised with the elimination of healthcare-associated pneumonia (HCAP). The HCAP designation resulted in the widespread expansion of broad-spectrum therapy for pneumonia despite very low rates of isolation of resistant pathogens such as MRSA or *P. aeruginosa*.³⁻⁵ Additionally, the widespread use of broad-spectrum antibiotics has not been associated with improved outcomes and may actually be associated with increased mortality.⁵⁻⁷ Current CAP guidelines recommend using patient risk assessment and individual facility data to determine if therapy for multidrug-resistant organisms (MDRO) is needed.

Risk Factors for Resistant Pathogens: Colonization with resistant pathogens in CAP is much less likely compared to HAP/VAP. Most CAP patients should be treated with agents targeting typical respiratory pathogens (beta-lactam + macrolide). Certain CAP patients are at increased risk of MDRO infection, but management varies based on the severity of illness. Risk factors for the isolation of resistant pathogens include history of respiratory colonization with MDROs (MRSA, Pseudomonas, gram negatives resistant to typical CAP agents, etc.) and those who have recently been hospitalized and been treated with broad spectrum antibiotics for at least 5 days (both antibiotic and hospital stay required). A history of colonization with resistant pathogens is predictive of subsequent isolation of this same pathogen. Specific pathogens of concern include MRSA, Pseudomonas, and other gram-negative rods resistant to typical CAP therapy (both ceftriaxone and levofloxacin). Additionally, antibiotic therapy, particularly broad-spectrum antibiotics selects for resistance and patients exposed to this, particularly while in the hospital are at increased risk of pneumonia due to a variety of resistant pathogens including both MRSA and resistant GNR. Finally, *S. aureus*, including MRSA, is a cause of post-influenza bacterial pneumonia and severe cavitary pneumonia.

The management of patients with risk factors for resistance (RFR) varies depending on severity of illness. In non-severe CAP with RFR the use of empiric, broad-spectrum therapy is **NOT** recommended. These patients should have a sputum sample obtained. If a resistant pathogen is detected, therapy could be targeted toward this organism although if the patient has improved on typical CAP therapy it is reasonable to continue and not treat the pathogens isolated.

In patients with severe CAP and RFR, it is reasonable to empirically use broad-spectrum therapy. Decisions on therapy choices should be individualized based on severity of illness and risk factors for resistance. For example, a patient admitted with non-severe CAP who has a history of MRSA sputum colonization should not be started on anti-MRSA therapy, but a sputum culture should be obtained. If MRSA is isolated a decision would need to be made treatment of this pathogen is necessary. Additionally, the presence of risk factors for one resistant pathogen does not equate to the need for therapy against another. To illustrate, in a patient admitted with severe CAP with a history of Pseudomonas sputum colonization, it would be reasonable to treat with piperacillin/tazobactam plus azithromycin, but there is no need for anti-MRSA therapy. Sputum testing should always be obtained when broad-spectrum therapy is started, and antibiotics narrowed based on the results.

Table 2: Risk Factors for Resistance in CAP

Risk Factors for MRSA	Risk factors for resistant Gram-negative rods (Pseudomonas, etc.)	Risk factors for MRSA and resistant Gram-negative rods
<ul style="list-style-type: none"> - History of MRSA sputum colonization (within 1 years) - Post-influenza pneumonia - Severe necrotizing pneumonia 	<ul style="list-style-type: none"> - History of sputum colonization with Pseudomonas or Gram-negative rod resistant to typical CAP therapy (within 1 years) 	<ul style="list-style-type: none"> - Recently hospitalized (last 90 days) and treated with broad spectrum antibiotics for at least 5 days (both required)

HAP/VAP: Patients who develop pneumonia within the first 5 days of hospitalization should be treated using the CAP guideline while those who develop pneumonia on day 6+ should be treated as HAP (see NM HAP/VAP guideline).

Corticosteroids: We recommend against using steroids in patients with pneumonia until more data exists to support their use. Steroid use in patients with COPD or asthma may be appropriate.

De-escalation: Broad-spectrum empiric antibiotic therapy must be accompanied by a commitment to choose pathogen-specific therapy once the culture and susceptibility results are known, which is usually within 48-72 hours. Clinical improvement usually becomes apparent after the first 48-72 hours of therapy, and therefore, the selected antimicrobial regimen should not be changed during this time unless progressive deterioration is noted, or initial microbiologic studies so dictate. For example, the detection of a specific pathogen on the pneumonia panel or detection of Legionella via a urine antigen may allow for early adjustments in therapy.

Switch to oral: It is not necessary to start all CAP patients on IV therapy if they can tolerate oral therapy. However, if the patient is being admitted to the ICU, it is recommended that the patient receive at least 24 hours of intravenous therapy. Doxycycline, levofloxacin, and azithromycin have excellent oral bioavailability. Patients with CAP may be changed to oral therapy when they are hemodynamically stable, improving clinically, and able to ingest and absorb oral medications. Patients with non-severe pneumonia should be rapidly (within 24 hours) transitioned to oral therapy if they can tolerate other oral medications.⁸

<p>Box 2: Criteria for Clinical Stability:</p> <ul style="list-style-type: none"> • Temperature ≤ 37.8 °C • Heart Rate ≤ 100 • Respiratory Rate ≤ 24 • Systolic blood pressure ≥ 90 mm Hg • Arterial oxygen saturation $\geq 90\%$ or pO₂ ≥ 60 mm Hg on room air
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Nonresponding pneumonia: Patients who do not improve should be evaluated for noninfectious mimics of pneumonia, unsuspected or drug-resistant organisms, extra-pulmonary sites of infection, and complications of pneumonia and its therapy. Diagnostic testing should be directed to whichever of these causes is likely.

Duration of Therapy: Most CAP cases can be treated safely with 5 days of therapy. Duration of therapy may be individualized and clinicians should consider response to therapy, severity of illness, and possible complications (empyema, etc.). Generally, patients should be improved and meet the markers of clinical stability (Box 2)

before stopping antibiotics. A recent randomized trial found antibiotics could be safely stopped at 3 days in patients who met the markers for clinical stability.⁹ Procalcitonin use can also safely decrease antibiotic duration and may be utilized to define individual patient durations of therapy that are even shorter than 5 days. Studies suggest that when PCT values return to normal (< 0.25) or decrease >80% from peak levels it is safe to stop antibiotics (see discussion below). Those with complications such as abscess, empyema or necrotizing pneumonia should generally receive longer durations of therapy based on the complication found and the pathogen isolated (consider Infectious Diseases consultation).

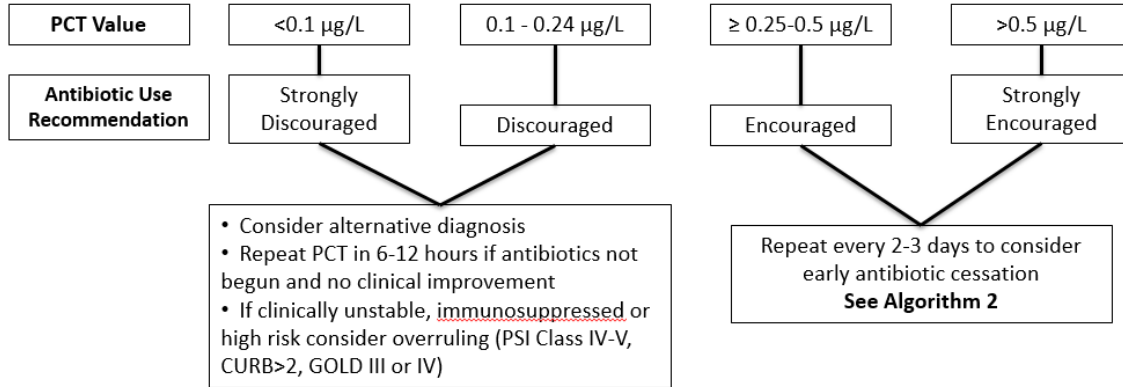
PROCALCITONIN:

Executive Summary: Procalcitonin (PCT) is most useful in situations of diagnostic uncertainty, where bacterial infection is unclear or alternative diagnoses are possible. Additionally, it can be used to shorten the duration of therapy, although if short duration of treatment (5 days) is already planned, PCT is unlikely provide additional benefit. **Decisions regarding antimicrobial therapy should NOT be based solely on PCT serum concentrations;** test results should be placed into the clinical context of each patient scenario considering the likelihood of bacterial infection, the severity of illness, and any other pertinent clinical data. There are non-infectious conditions which can result in elevated PCT levels (see NM PCT guidance). Finally, if PCT levels will not influence decision-making, do not order the test.

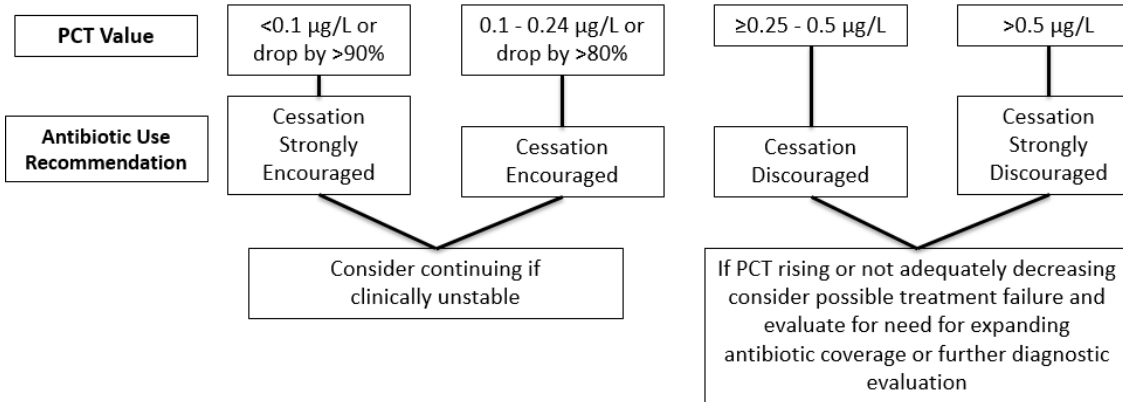
Procalcitonin (PCT) is the most specific biomarker available diagnosis of systemic bacterial infection and has been shown to have utility in antibiotic decision making in lower respiratory tract infections (LRTI). Multiple randomized clinical trials support the use of PCT for assisting clinicians in antibiotic management in LRTI including pneumonia, exacerbations of chronic bronchitis, and other assorted lower respiratory tract infections (bronchitis, asthma exacerbation, etc.).¹⁰⁻¹² A patient level meta-analysis of 26 trials with 6708 patients found the use of PCT in LRTI resulted in a significant decrease in mortality (OR 0.83 (95% CI 0.70-0.99, p=.037).¹³ PCT use was also associated with a reduction in antibiotic exposure by 2.4 days and decreased antibiotic side effects. Studies specifically addressing its use in pneumonia have had similar findings of decreased antibiotic use with equivalent or improved clinical outcomes.¹⁰ Although it should be noted that a recent trial where control group antibiotic duration was very short (mean 4.3 days) did not show benefit from PCT use.¹⁴ This suggests that when short courses of antibiotics are already in use PCT has less utility in shortening duration of therapy. Procalcitonin is not generally useful in determining the specific microbial etiology of CAP but can be useful in situations where there diagnostic uncertainty exists regarding the need for antibiotics such as differentiating pneumonia from heart failure.^{15,16} Based on this data we continue to recommend PCT use to assist clinicians in decisions regarding initiation and discontinuation of antimicrobial therapy.

When PCT is used in pneumonia it is recommended it be measured on admission and every 2-3 days subsequently. Interpretation of PCT values should be as listed below in **Algorithms 1 and 2**.

Algorithm 1: LRTI Initial PCT Value



Algorithm 2: LRTI PCT Value Follow Up



Community-Acquired Pneumonia (CAP) in Immunocompromised (IC) Patients

Summary: The IDSA-ATS CAP guidelines do not address the management of pneumonia in immunocompromised patients although this represents a significant proportion of pneumonia patients. In a nationwide epidemiologic analysis of pneumonia-associated hospitalizations in the US between 2001-2014, the presence of immunocompromising condition increased from 19% in 2001 to 30% by 2014.¹⁷

Data on management of pneumonia in IC patients is scarce and we have summarized information and made recommendations for initial CAP management in IC adults. Early infectious disease consultation is strongly encouraged in the IC population due to the likelihood of encountering atypical pathogens.

Definition of Immunocompromise: The definition of immunocompromise varies across studies and pneumonia etiology may differ based on the IC condition. Various immunosuppressive medications and conditions may predispose to some pathogens over others and general guidelines on therapeutic choices are provided below. The list of conditions that are addressed is included below.

- HIV/AIDS, hematologic malignancy, active malignancy receiving chemotherapy, receipt of solid-organ or hematopoietic cell transplantation, immunosuppressive therapy (including prednisone 0.5 mg/kg/day for at least 14 days or equivalent), certain autoimmune or rheumatologic conditions, liver or kidney dysfunction, certain metabolic or endocrinopathies, asplenia (functional or anatomic) and other underlying immune deficiency (primary immunodeficiency, etc.).

Diagnostic Testing: In general, immunocompromised patients have increased risk factors for atypical, non-CAP pathogens, and co-infection. Providers should have a lower threshold to obtain diagnostic testing depending on level of immunosuppression. See Table 1 in CAP Guidance for diagnostic recommendations. In addition, patients should be assessed for risk of opportunistic infections. Testing for atypical bacteria, *Pneumocystis*, fungi or mycobacteria should be considered especially when patients fail to respond to standard CAP therapy.

Antimicrobial Management: Many of the same principles for treating general CAP apply to immunocompromised CAP. Do not routinely provide broad-spectrum antibiotics (anti-MRSA or anti-Pseudomonas) but assess patient-specific risk factors for MRSA and Pseudomonas. Seek Infectious Disease (ID) consultation for suspicion and management of opportunistic or atypical infections. Special attention to drug-drug interactions and adverse effects in patients with pre-existing organ dysfunction is encouraged.

Table 2: General Guidance for use of Broad-Spectrum Agents in IC CAP:

Indications for MRSA treatment†:	Indications for <i>Pseudomonas</i> treatment*:
Generally not indicated. Obtain respiratory tract cultures If risk factors present, consider empiric therapy in non-severe CAP, and add in severe CAP: <ul style="list-style-type: none"> - Previous isolation of MRSA in sputum - Recent hospital stay with IV antibiotics (5 days) - Post-influenza or necrotizing pneumonia 	Generally not indicated. Obtain respiratory tract cultures If risk factors present, consider empiric therapy in non-severe CAP, and add in severe CAP: <ul style="list-style-type: none"> - Previous <i>Pseudomonas</i> in sputum - Recent hospital stay with IV antibiotics (5 days) - Lung transplant

*Cefepime 1g IV q6h OR piperacillin/tazobactam 4.5g IV q8h infused over 4 hours.

†Add Vancomycin (pharmacy to dose) OR linezolid 600 mg IV or PO q12h to typical CAP therapy

Table3: Specific CAP Considerations by Immunocompromised Condition

Immunocompromised-Specific Guideline	Etiology and Diagnostic Considerations	Treatment Considerations
HIV (AIDS Info guidelines hyperlinked, p. G-1)	<ul style="list-style-type: none"> • <i>Strep pneumoniae</i>, <i>H. influenzae</i> common. • Assess risk factors for OIs (<i>Pneumocystis</i>, TB/NTMs, etc), including co-infection 	<ul style="list-style-type: none"> • Per NM CAP guidelines • For concern for OI, consult ID
Solid Organ Transplant (American Society of Transplantation ID Community of Practice pneumonia guideline hyperlinked)	<p>Etiology is highly dependent on level of immunosuppression and time since transplant.</p> <ul style="list-style-type: none"> • Early post-Tx may often have risk factors for MRSA and Pseudomonas, later more typical organisms • Assess risk factors for OIs (atypical bacteria, PJP, endemic & invasive fungi, respiratory viruses) • Diagnostic work-up is strongly encouraged in consultation with ID 	<ul style="list-style-type: none"> • Anti-MRSA or anti-Pseudomonas often not needed, evaluate risk factors as above • Those without risk treat per NM CAP guidelines • For concern for OI, consult ID. • Lung transplant recipients: consult Transplant Pulmonology +/- ID
Oncology (See National Cancer Care Network Guidelines: Prevention and Treatment of Cancer Related Infections)	<p>Etiology is dependent on type & status of malignancy, active chemotherapy or immunotherapies, other immunosuppressive agents.</p> <ul style="list-style-type: none"> • Assess risk factors for OIs (atypical bacteria, PJP, endemic & invasive fungi, respiratory viruses) • Diagnostic work-up is strongly encouraged in consultation with ID 	<ul style="list-style-type: none"> • Cancer survivors off immunosuppressive agents, per NM CAP guidelines • Neutropenic patients: anti-Pseudomonal should be included in CAP regimen • Anti-MRSA agent usually not needed; base on patient-specific risk factors • For concern for OI, consult ID.
Patients on long-term corticosteroids (prednisone equivalent of 0.5 mg/kg/day) ≥2 weeks	<ul style="list-style-type: none"> • At increased risk for microbiologic etiology not covered by typical antimicrobial agents • Assess patient-specific risk factors for MRSA, <i>Pseudomonas</i>, respiratory viruses, and OIs (PJP, mold, etc) • Diagnostic work-up is encouraged. 	<ul style="list-style-type: none"> • Per NM CAP guidelines • Evaluate need for anti-MRSA and anti-Pseudomonal therapy using patient risk factors • For suspected OI, consult ID or pulmonology
Asplenia (functional or anatomic)	<ul style="list-style-type: none"> • Encapsulated organisms including <i>Strep pneumoniae</i>, <i>H. influenzae</i> are common. 	<ul style="list-style-type: none"> • Per NM CAP guidelines
Advanced cirrhosis	<ul style="list-style-type: none"> • <i>Strep pneumoniae</i> is most common pathogen 	<ul style="list-style-type: none"> • Per NM CAP guidelines
Chronic kidney disease	<ul style="list-style-type: none"> • <i>Strep pneumoniae</i>, <i>H. influenzae</i> common 	<ul style="list-style-type: none"> • Per NM CAP guidelines

APPENDIX A: Antimicrobial Dosing

Ampicillin/Sulbactam 3g q6h

Amoxicillin 1 g PO q8h

Amoxicillin/clavulanate ER 2 g PO q12h

Azithromycin 500 mg PO/IV once then 250 mg daily

Aztreonam 2 g IV q8h

Cefepime 1 g IV q6h

Ceftriaxone 2 g IV daily

Cefuroxime 500 mg PO q12h

Doxycycline 100 mg PO/IV q12h

Levofloxacin 750 mg PO/IV daily

Linezolid 600 mg PO/IV q12h

Piperacillin/tazobactam 4.5 g IV q8h over 4 hours

Vancomycin 15 mg/kg IV q12h

APPENDIX B: The Pneumonia PORT prediction rule

1. Classify patient into risk class I if they are aged ≤ 50 years, have no neoplastic disease, liver disease, cerebrovascular disease, renal disease, or congestive heart failure, and have normal or only mildly abnormal vital signs and normal mental status.
2. Use the tables below to calculate a PORT score for those patients in risk classes II – V and determine site of care.

Patient Characteristic	Points assigned^a
Demographic factor	
Age	
Male	# of years of age
Female	# of years of age - 10
Nursing home resident	+10
Comorbid illnesses	
Neoplastic disease ^b	+30
Liver disease ^c	+20
Congestive heart failure ^d	+10
Cerebrovascular disease ^e	+10
Renal disease ^f	+10
Physical examination findings	
Altered mental status (disorientation, stupor, or coma)	+20
Respiratory rate > 30 breaths/min	+20
Systolic blood pressure < 90 mm Hg	+20
Temperature < 35°C or > 40°C	+15
Pulse > 125 beats/min	+10
Laboratory or radiographic findings	
Arterial pH < 7.35	+30
Blood urea nitrogen > 30 mg/dL	+20
Sodium < 130 mEq/L	+20
Glucose > 250 mg/dL	+10
Hematocrit < 30%	+10
Arterial partial pressure of oxygen < 60 mm Hg ^g	+10
Pleural effusion	+10

^a A total point score for a given patient is obtained by adding the patient’s age in years (age – 10 for females) and the points for each applicable patient characteristic.

^b Any cancer except basal or squamous cell cancer of the skin that was active at the time of presentation or diagnosed within 1 year of presentation.

^c A clinical or histologic diagnosis of cirrhosis or other form of chronic liver disease such as chronic active hepatitis.

^d Systolic or diastolic ventricular dysfunction documented by history and physical examination, as well as chest radiography, echocardiography, Muga scanning, or left ventriculography.

^e A clinical diagnosis of stroke, transient ischemic attack, or stroke documented by MRI or computed axial tomography.

^f A history of chronic renal disease or abnormal blood urea nitrogen and creatinine values documented in the medical record.

^h An oxygen saturation value < 90% on pulse oximetry or intubation before admission is also considered abnormal.

Risk class	# of points	Mortality %	Recommended site of care
I	NA	0.1	Outpatient
II	≤ 70	0.6	Outpatient
III	71-90	2.8	Outpatient
IV	91-130	8.2	Inpatient
V	> 130	29.2	Inpatient

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