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MANAGING CAP
Are you up-to-date?

New recommendations aim for outpatient treatment whenever appropriate, and a better vaccination rate

When is outpatient treatment appropriate for community-acquired pneumonia (CAP)? Which antibiotics are recommended for outpatient therapy? What are the best prevention strategies? The answers are in the consensus guidelines published earlier this year by the Infectious Diseases Society of America and the American Thoracic Society (IDSA/ATS). The new guidelines update an IDSA guideline published in 2003.

Background. Management (and prevention) of CAP is inconsistent, and there is also emerging resistance of pneumococcus to macrolides.

These guidelines were developed to hasten consistency among caregivers and hospitals in the care of patients with pneumonia. Appropriateness of outpatient care, severity of illness assessment, hospital treatment decisions, ICU care, and choice of antibiotics for high-risk patients and for drug-resistant *S pneumonia* were reviewed. The joint committee recommended that hospitals standardize care and create policies to increase the vaccination rate.

By definition, CAP is acquired outside a hospital or long-term care facility. However, the new guidelines include ambulatory residents of nursing homes.

Adults with CAP are the focus of the guidelines, not immunocompromised patients, cancer patients receiving chemotherapy, patients on high-dose steroid therapy, or children under 18 years.

Epidemiology. There are about 5.6 million cases of CAP in the United States

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Practice Recommendations
For our purposes, the evidence ratings are based on literature quality, not expert opinion, and are updated to comply with the SORT taxonomy*

Grade A Recommendations
- Severity-of-illness scores can be used to identify patients with CAP who are candidates for outpatient treatment.
  - CURB-65 criteria: confusion, uremia (BUN ≥20 mg/dl), respiratory rate ≥30 breaths/min, low blood pressure requiring fluids, and age >65 years risk stratify patients. If 2 or more these criteria are present, admit to the hospital.
  - Pneumonia Severity Index[1] is an alternative prediction rule to identify patients who can be treated safely in the outpatient setting.
- Appropriate outpatient antibiotic treatment for a previously healthy person, with no risk factors for drug-resistant S. *pneumonia* (DRSP) is a macrolide (azithromycin, clarithromycin, or erythromycin).
- High risk patients: those with co-morbidities (chronic heart, lung, liver, or renal disease), diabetes mellitus, alcoholism, malignancies, asplenia, immunosuppression, or antibiotics within 3 months should be treated with a respiratory fluoroquinolone—moxifloxacin, gemifloxacin, or levofloxacin (750 mg dose).
- A beta-lactam (high-dose amoxicillin, amoxicillin clavulanate, ceftriaxone, cefpodoxime, of cefuroxime), plus a macrolide is an option for high risk patients.
- Blood cultures and sputum cultures are optional prior to treatment of outpatients.
- In geographic areas where >25% of pneumococcal organisms are macrolide resistant, a beta-lactam, plus docxycycline should be considered.
- Treat with antibiotics at least 5 days.

- Health care workers in inpatient and outpatient settings and long-term facilities should receive annual influenza immunization.

Grade B Recommendations
- Severity of illness scores should be supplemented with physician subjective opinion about individual patients. The ability to safely and reliably take oral medications and the availability of outpatient resources should be considered.
- Patients with CAP should be investigated for specific pathogens that would significantly alter standard (empirical) management decisions, when suspected on the basis of clinical assessment.
- A beta-lactam, plus doxycycline is an alternative to the beta-lactam, plus macrolide combination for high risk patients.
- Pneumococcal polysaccharide vaccine is recommended for persons >65 years of age and for those with selected high-risk concurrent diseases.

Grade C Recommendations
- In addition to clinical features, an infiltrate by chest radiograph or other imaging technique is required for the diagnosis of pneumonia.
- An appropriate outpatient treatment for previously healthy individuals with no risk factors for DRSP infection is doxycycline.
- Use respiratory hygiene measures (hand hygiene, masks, tissues) for patients with cough in outpatient settings.

*Ebell M, Siwek J, Weiss BD, et al. Strength of recommendation taxonomy (SORT): A patient-centered approach to grading evidence in the medical literature. *J Fam Pract* 2004; 53:111–120.

Cases that test your skills

CASE 1

Your patient is a 45-year-old man with cough, fever, and chills. He has a history of metabolic syndrome, and a 40 pack-year smoking history. He was well until 1 week ago when he went camping in the rain. Over the last 2 days he has had shaking chills, cough productive of green phlegm, and he finds that he gets a bit short-winded when walking stairs. He wonders if he has pneumonia. He is overweight and in no acute distress.

T 101 • P 88 • RR 18 • WT 220 • HT 5 7

Exam Normal other than localized coarse rales in the left posterior lung field; spot O_2 saturation is 96%

What is your diagnosis and initial management?
Which of the following statements are true regarding the outpatient management of pneumonia?

A. If 2 or more CURB-65 criteria are present, the patient should be hospitalized

B. A macrolide is an appropriate choice of treatment for a previously healthy person with no risk of drug resistance

C. A positive chest x-ray or other imaging is required for the diagnosis

D. Blood cultures and sputum cultures must be obtained

E. Antibiotic treatment should be a minimum of 10 days

CASE 2

A 76-year-old man is brought into the office by his niece. "I just don't feel well," he says. The patient has been increasingly ill over the past week, and his niece is concerned that he seems to have trouble breathing. The patient minimizes his symptoms, but in relaying his history, he is obviously short of breath and cannot talk continuously. He needed a wheelchair to come in from the parking lot (and you know that he is usually spry and ambulatory). He has a history of congestive heart failure, hypertension, type 2 diabetes mellitus, depression, and osteoarthritis. He takes furosemide, potassium, enalapril, lantus insulin, sertraline, and PRN acetaminophen. He has never smoked. He denies PND and orthopnea. He is clearly short of breath and in some mild distress.

T 99 • P 102 • RR 36 • WT 260 • HT 5 9

Exam Remarkable for diffuse rhonchi and wheezing across all lung fields; spot O_2 saturation is 89%

What is your diagnosis and initial management?
The differential diagnosis for this patient includes:

A. Bacterial pneumonia

B. Viral pneumonia

C. Depression

D. Congestive heart failure

E. Pulmonary embolus

ANSWERS: **A, B, AND C**

Diagnosis Community acquired pneumonia—left lobar.

Initial management This patient can be treated as an outpatient based on the severity-of-illness scores in this guideline. He should be treated with antibiotics a minimum of 5 days. With his comorbidities, antibiotic choices include 1) a fluoroquinolone, 2) a beta-lactam plus macrolide, or 3) (in areas with high prevalence of macrolide resistance) a beta-lactam plus doxycycline.

ANSWERS: **A, B, D, E**

Diagnosis This interstitial pattern on the chest x-ray is associated with multiple etiologies, both infectious and non-infectious. Examples include viral pneumonia, opportunistic infections in HIV patients, atypical infections such as mycoplasm, congestive heart failure, and pulmonary embolus.

Initial management Based on severity-of-illness scores, this patient should be admitted to the hospital. He should have further evaluation to identify the etiology.

annually, and the cost is about $8.4 billion.[1] Death rates increase with comorbidities and older age. There are no race or gender differences in morbidity.

Limitations of the guidelines. The decision whether to admit a patient with CAP is crucial, since the majority of the pneumonia care expenditures are the result of inpatient care.[2] The guidelines do not state the outcomes that were considered or adverse events associated with therapy. It is weakened by lack of cost analysis and absence of clinical algorithms.

How the evidence was graded. Electronic databases were searched through June 2006. Experts considered reviews and meta-analyses and weighted the evidence according to a rating scheme. They graded each recommendation on the quality of the literature (levels I, II, or II) and by expert interpretation (strong, moderate, or weak). A strong recommendation required that more than 50% of the experts grade it as strong and the majority of the remainder grade it as moderate.

Most patients with CAP should receive a strongly rated intervention, and the rationale for variation should be apparent from the medical record. With a moderate or weak recommendation, the committee suggested, most physicians would follow the recommended management, but many would not.

Disclosure

No potential conflict of interest relevant to this article was reported.

References

1. Lutfiyya MN, Henley E, Chang LF, Reyburn SW. Diagnosis and treatment of community-acquired pneumonia. *Am Fam Physician* 2006; 73:442-50.

2. Niederman MS, McCombs JS, Unger AN, Kumar A, Popovian R. The cost of treating community-acquired pneumonia. *Clin Ther* 1998; 20:820–837.

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MANAGING CAP
An evidence-based algorithm

8 guidelines for site-of-care and treatment decisions

The 2007 guidelines from the Infectious Diseases Society of America (IDSA)/American Thoracic Society (ATS)[1] are a blend of level-of-evidence strength and consensus opinion—a unified, evidence-based document. These new recommendations address prior discrepancies between the 2 specialties. We developed a CAP treatment algorithm based on the new advisory. (The following text includes levels of evidence.)

❚ Site-of-care decisions

1. Let severity score be your guide

Based on evidence that physicians often hospitalize patients for CAP who could be managed as outpatients, the new guidelines recommend that we use an illness severity score (strong recommendation, level I evidence).

Previous guidelines advised only that we *consider* using a severity score.

• Use the validated **Pneumonia Severity Index** or the easier-to-use **CURB-65.** Patients with a CURB-65 score of 2 or more generally require hospitalization (moderate recommendation, level III evidence).

• Ability to reliably and safely **take medications at home** must also be taken into account (strong recommendation, level II evidence.)

2. Admit to ICU promptly if needed

The criteria for admission to the ICU is similar to the previous ATS guidelines, but the list of minor criteria is more extensive. This change reflects evidence demonstrating worse outcomes in patients whose transfer to the ICU was delayed. This new criteria has not been validated.

• **Patients requiring vasopressors for blood pressure support or with hypoxemic respiratory failure** should be admitted to the ICU—these are major criteria (strong recommendation, level II evidence).

• **Patients with 3 or more minor criteria** should also be directly admitted to the ICU (moderate recommendation, level II evidence).

3. Identify who needs more tests

In the wake of controversy about diagnostic testing recommendations, the new guidelines attempt to better identify patients who would benefit from further testing (**TABLE**).

• **12 indications.** Prior ATS guidelines lacked specifics on required additional testing, but the new guidelines give 12 clinical indications for more extensive evaluation, and identify which tests are recommended for each indication (strong recommendation, level II evidence).

• **Routine testing** to identify the cause of CAP in outpatients is optional (moderate recommendation, level III evidence).

▌Empiric antibiotics

The recommendations of IDSA/ATS are generally for a class of antibiotics rather than a specific drug, unless noted.

4. Assess DRSP risk factors

Growth of drug-resistant *Streptococcus pneumoniae* (DRSP) necessitated a more extensive list of risk factors for DRSP. Other recommendations did not change.

Outpatient treatment

• Adults who were previously healthy and who do not have risk factors for DRSP CAP should be treated with either a mac-

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TABLE

Clinical indications for more extensive diagnostic testing

CLINICAL INDICATION	RECOMMENDED DIAGNOSTIC TESTS			
	BLOOD CULTURE	SPUTUM CULTURE	LEGIONELLA URINARY ANTIGEN TEST	PNEUMOCOCCAL URINARY ANTIGEN TEST
ICU admission*	✓	✓	✓	✓
Failed outpatient therapy		✓	✓	✓
Cavitary infiltrates†	✓	✓		
Leukopenia	✓			✓
Active alcohol abuse	✓	✓	✓	✓
Chronic severe liver disease	✓			✓
Severe lung disease		✓		
Asplenia Anatomic or functional	✓			✓
Recent travel‡ Within past 2 weeks			✓	
Positive Legionella urinary antigen test		✓	N/A	
Positive Pneumococcal urinary antigen test	✓	✓		N/A
Pleural effusion**	✓	✓	✓	✓

Additional tests:

* Endotracheal aspirate if intubated, possibly bronchoscopy or nonbronchoscopic bronchoalveolar lavage.

† Fungal and tuberculosis cultures.

‡ Region/type of travel related to *Legionella, Coccidioides,* Hantavirus, *B pseudomallei,* avian influenza, SARS.

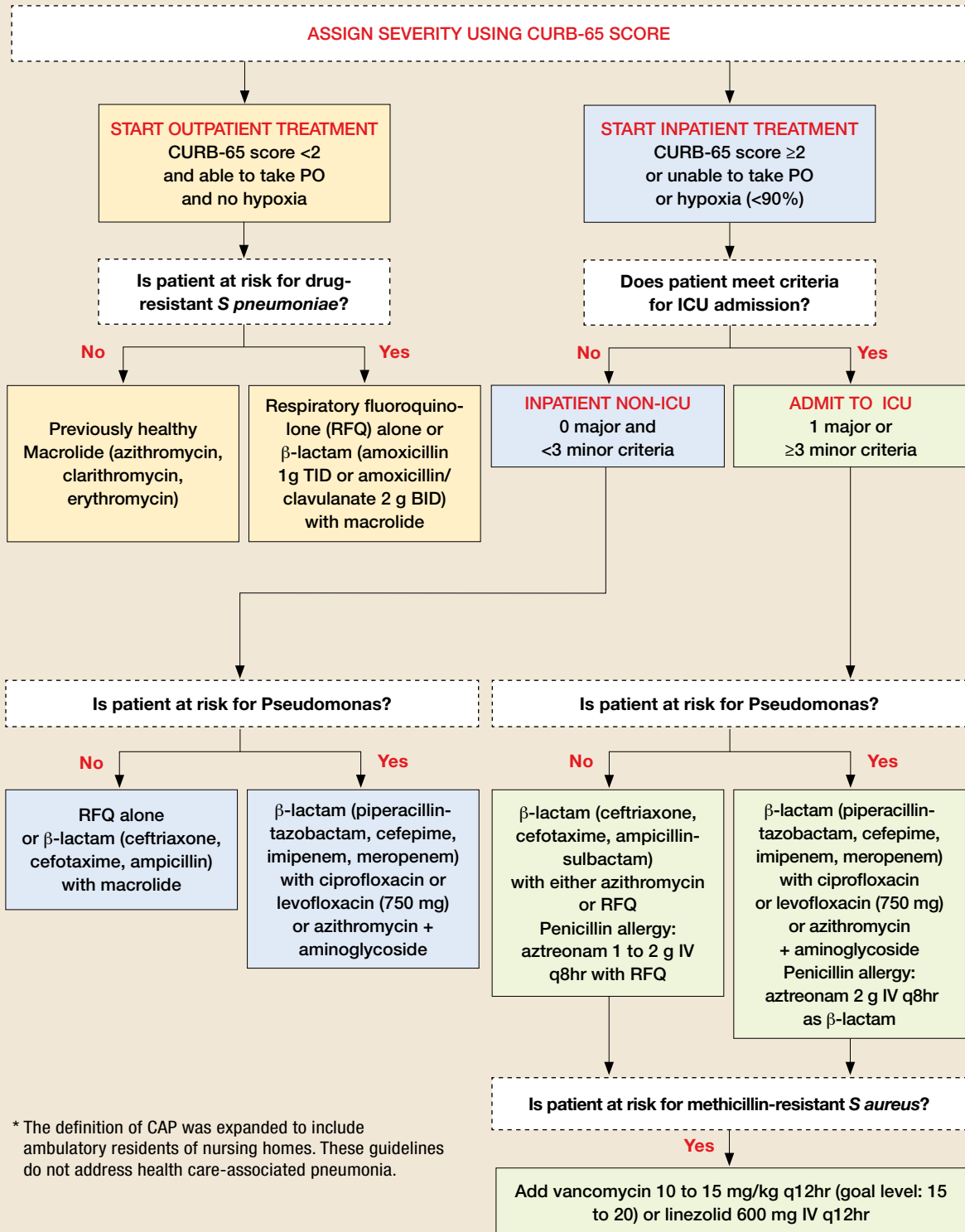** Thoracentesis and pleural fluid cultures.

Adapted from Mandell et al.[1]

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rolide (azithromycin, clarithromycin, or erythromycin) (strong recommendation, level I evidence) or doxycycline (weak recommendation; level III evidence).

• In the presence of comorbidities that increase the risk for DRSP, these antibiotics are appropriate: a respiratory fluoroquinolone (moxifloxacin, gemifloxacin, or levofloxacin [750 mg/day dose]) (strong recommendation, level I evidence); or β-lactam plus a macrolide: (high-dose amoxicillin [eg, 1 g 3x daily] [strong recommendation, level I evidence] or amoxicillin-clavulanate [2 g twice daily] is preferred; but alternatives include ceftriaxone, cefpo-

Treatment of community-acquired pneumonia*

ASSIGN SEVERITY USING CURB-65 SCORE

START OUTPATIENT TREATMENT
CURB-65 score <2
and able to take PO
and no hypoxia

START INPATIENT TREATMENT
CURB-65 score ≥2
or unable to take PO
or hypoxia (<90%)

Is patient at risk for drug-resistant *S pneumoniae*?

No   **Yes**

Does patient meet criteria for ICU admission?

No   **Yes**

Previously healthy
Macrolide (azithromycin,
clarithromycin,
erythromycin)

Respiratory fluoroquino-lone (RFQ) alone or
β-lactam (amoxicillin
1g TID or amoxicillin/
clavulanate 2 g BID)
with macrolide

INPATIENT NON-ICU
0 major and
<3 minor criteria

ADMIT TO ICU
1 major or
≥3 minor criteria

Is patient at risk for Pseudomonas?

No   **Yes**

Is patient at risk for Pseudomonas?

No   **Yes**

RFQ alone
or β-lactam (ceftriaxone,
cefotaxime, ampicillin)
with macrolide

β-lactam (piperacillin-tazobactam, cefepime,
imipenem, meropenem)
with ciprofloxacin or
levofloxacin (750 mg)
or azithromycin +
aminoglycoside

β-lactam (ceftriaxone,
cefotaxime, ampicillin-sulbactam)
with either azithromycin
or RFQ
Penicillin allergy:
aztreonam 1 to 2 g IV
q8hr with RFQ

β-lactam (piperacillin-tazobactam, cefepime,
imipenem, meropenem)
with ciprofloxacin
or levofloxacin (750 mg)
or azithromycin
+ aminoglycoside
Penicillin allergy:
aztreonam 2 g IV q8hr
as β-lactam

Is patient at risk for methicillin-resistant *S aureus*?

Yes

Add vancomycin 10 to 15 mg/kg q12hr (goal level: 15
to 20) or linezolid 600 mg IV q12hr

* The definition of CAP was expanded to include
ambulatory residents of nursing homes. These guidelines
do not address health care-associated pneumonia.

doxime, and cefuroxime [500 mg twice daily]. Doxycycline [level II evidence] is an alternative to the macrolide.)

Inpatient non-ICU treatment

• β-lactam plus a macrolide (strong recommendation, level I evidence) (cefotaxime, ceftriaxone, and ampicillin; ertapenem for selected patients; doxycycline [level III evidence] is an alternative to the macrolide.).

• A respiratory fluoroquinolone (strong recommendation, level I evidence) is the treatment of choice for penicillin-allergic patients.

5. Assess MRSA risk factors

Although similar to the prior ATS guidelines, the new guidelines have added specific risk factors for community-acquired methicillin-resistant *S aureus* (MRSA). This change reflects the increasing prevalence of community-acquired MRSA as an etiology for CAP.

The new guidelines state that the overwhelming majority of CAP pathogens will be adequately treated with the recommended empiric regimens. Exceptions are infections due to community-acquired methicillin-resistant *S aureus* and *Pseudomonas aeruginosa*.

ICU treatment

• A β-lactam (cefotaxime, ceftriaxone, or ampicillin-sulbactam) plus either azithromycin (strong recommendation, level II evidence) or a respiratory fluoroquinolone (strong recommendation, level I evidence).

• For penicillin-allergic patients, a respiratory fluoroquinolone and aztreonam are recommended.

• For *Pseudomonas* infection (see **FIGURE** for risk factors), use an antipneumococcal, antipseudomonal β-lactam (piperacillin-tazobactam, cefepime, imipenem, or meropenem) plus either ciprofloxacin or levofloxacin (750-mg dose) or the above β-lactam plus an aminoglycoside and azithromycin or the above β-lactam plus aminoglycoside and a respiratory fluoroquinolone (moderate recommendation, level II evidence).

FAST TRACK

Growth of drug resistant *S pneumoniae* necessitated a more extensive list of risk factors

KEY

CURB-65 score for assessing severity of illness
Confusion
Uremia BUN >20
Respiration ≥30
BP <90/≤60 mm Hg
≥**65** years of age

TOTAL POINTS	MORTALITY RATE
0	0.7%
1	2.1%
2	9.2%
3	14.5%
4	40.0%
5	57.0%

Criteria for ICU admission

Major
Invasive mechanical ventilation
Septic shock with need for vasopressors

Minor
• Respiration ≥30
• PaO$_2$/FiO$_2$ ≤250
• Multilobar infiltrates
• Disorientation
• BUN ≥20
• Hypotension requiring aggressive fluids
• Temperature <36°C
• Platelets <100,000
• WBC<4000

Risk factors
Drug-resistant *S pneumoniae*
• Any antibiotics within 3 months
• Comorbidities: Cardiac disease, diabetes mellitus, alcoholism, pulmonary disease, renal disease, liver disease, asplenia, malignancy, immunosuppressed.
• age >65 years

Pseudomonal infection
• Structural lung disease (bronchiectasis)
• Severe COPD with frequent admissions, recent antibiotic and steroid use

Methicillin-resistant *S aureus*
Pulmonary abscess
End-stage renal disease
IV drug abuse
Recent influenza
Recent fluroquinolone use

Duration of antibiotic treatment
• At least 5 days
• After 5 days, antibiotics may be discontinued when patient is afebrile 72 hours and has no more than 1 criteria for instability: temperature ≥37.8ºC, heart rate ≥100, respiration ≥24, systolic BP ≤90 mm Hg, O$_2$ saturation ≤90%, inability to maintain oral intake, altered mental status
• 15 days for CAP due to Pseudomonas

Criteria for discharge
Temperature ≤37.8°C, heart rate ≤100, respiration ≤24, systolic BP ≥ 90 mm Hg, O$_2$ saturation ≥90%, ability to maintain oral intake, normal mental status

Evidence scale used in the Guidelines for CAP in Adults

LEVEL I HIGH

Well-conducted, randomized controlled trials

LEVEL II MODERATE

Well-designed, controlled trials without randomization (including cohort, patient series, and case-controlled studies); large case series in which systematic analysis of disease patterns and/or microbial etiology was conducted; and reports of data on new therapies that were not collected in a randomized fashion.

LEVEL III LOW

Case studies and expert opinion. In some instances, therapy recommendations may come from antibiotic susceptibility data without clinical observations.

Adapted from: Mandell et al.[1]

Fifteen days of therapy may be effective in *Pseudomonas* CAP based on nosocomial infection data.

• For community-acquired methicillin-resistant *S aureus* infection (see **FIGURE** for risk factors), add vancomycin or linezolid (moderate recommendation, level III evidence).

Diagnostic testing is of high yield for patients with severe CAP requiring ICU admission, allowing for early de-escalation of empirical treatment if results are negative.

Pathogen-directed therapy
6. Identify the pathogen

New guidelines recommend that, once the pathogen is identified by reliable microbiological methods, therapy should be directed towards that specific pathogen to prevent increased resistance in the community (moderate recommendation, level III evidence).

Influenza. Treatment within 48 hours of symptom onset with oseltamivir or zanamivir is recommended for influenza A (strong recommendation, level I evidence).

While these antimicrobials should not be used in uncomplicated influenza with symptoms for >48 hours (level I evidence), they may be used in hospitalized patients or influenza pneumonia to reduce viral shedding (moderate recommendation, level III evidence).

Time to first dose
7. Start treatment in the ED

Rather than designating a time window for starting treatment, the IDSA/ATS committee recommended that patients receive the first antibiotic dose in the Emergency Department (moderate recommendation, level III evidence).

This newly added statement contrasts with some current quality measures that grade hospitals according to whether antibiotics are started within a specific time frame.

Duration of antibiotics
8. Base duration on specific criteria

Reflecting evidence that shorter courses appear to be as effective as longer courses, the newer guidelines recommend discontinuation when the patient meets specific clinical criteria. Before discontinuing antibiotics, all patients with CAP should:

• Be treated for at least 5 days (level I evidence),

• Be afebrile for 48 to 72 hours, and

• Have no more than 1 of these criteria for clinical instability (moderate recommendation, level II evidence): temperature ≥37.8ºC; heart rate ≥100 beats/min; respiratory rate ≥24 breaths/min; systolic blood pressure ≤90 mm Hg; arterial oxygen saturation ≤90% or pO_2 ≤60 mm Hg on room air; inability to maintain oral intake; altered mental status.

Switching from IV to oral

The guidelines, similar to the prior guidelines, recommend switching to oral therapy for hemodynamically stable patients who are clinically improving, able to ingest medications, and have a normally functioning gastrointestinal tract (strong recommendation, level II evidence).

Hospital discharge

The guidelines recommend that patients be discharged as soon as they are clinically stable and have a safe environment for continued care. Patients receiving oral therapy do not require inpatient observation (moderate recommendation, level II evidence). This is unchanged from prior recommendations. ∎

Reference

1. Mandell LA, Wunderink RG, Anzueto A, Bartlett JG, Campbell D, Dean NC, et al. IDSA/ATS consensus guidelines on the management of community-acquired pneumonia in adults. *Clin Infect Dis* 2007:44 (Suppl 2) S27-S72.