

# The IDSA/ATS consensus guidelines on the management of CAP in adults

F. Piffer  
F. Tardini  
R. Cosentini

U.O. Medicina d'Urgenza,  
Gruppo NIV, Fondazione  
Ospedale Maggiore Policlinico,  
Mangiagalli e Regina Elena,  
Milan, Italy.

## Correspondence

R. Cosentini  
Gruppo NIV  
Fondazione Ospedale Maggiore  
Policlinico  
Mangiagalli e Regina Elena  
U.O. Medicina d'Urgenza  
Via F. Sforza, 35  
20122 Milan  
Italy  
Fax: 39 255033600  
E-mail: roberto.cosentini  
@policlinico.mi.it

In March 2007, the Infectious Diseases Society of America (IDSA) and the American Thoracic Society (ATS) issued a consensus guidelines document on the management of community-acquired pneumonia (CAP) [1]. The document includes important advances and unifies the previous guidelines released separately by the two societies.

## Strength of recommendation and evidence level

Each recommendation is graded in terms of strength (strong, *i.e.* most patients should receive the intervention; moderate; and weak) together with evidence level (level I: randomised studies; level II: nonrandomised studies, case series; and level III: case studies, expert opinions).

## Objective of the guidelines

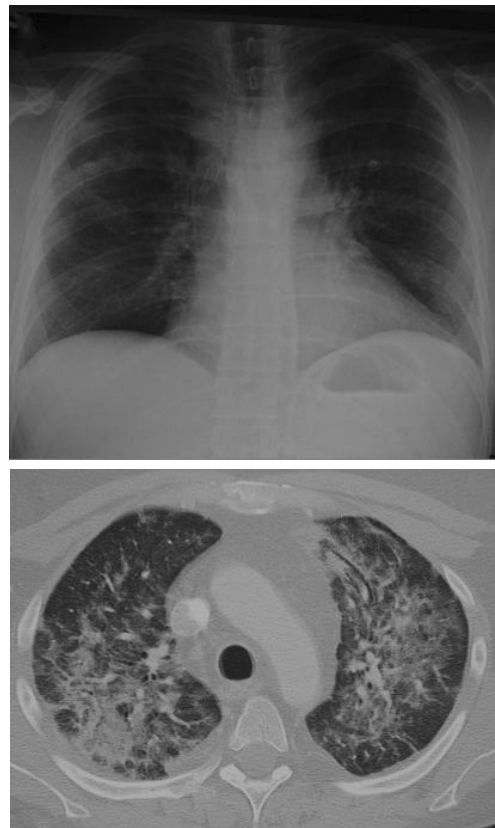
The declared objective of these guidelines is a decrease in mortality. The authors believe that the application of guidelines can decrease mortality and the discussion is primarily focused on this outcome. CAP management guidelines should be locally adapted and implemented.

## The physicians addressed

These guidelines address emergency medicine physicians, hospital physicians and primary care physicians. They could also be an important consultation tool for specialists involved in the management of pneumonia.

## The patients addressed

Patients addressed by these guidelines are adult immunocompetent subjects with CAP. This means that the approach to pneumonia occurring in nonambulatory residents of nursing homes is not included in these guidelines and should be treated according to published guidelines of healthcare-associated pneumonia [2].



## How to assess severity? Where to treat my patient?

- Clinical judgement is crucial.
- Severity scores are useful and should be implemented.

The authors suggest using a severity score, either the Pneumonia Severity Index (PSI) score or the CURB-65 (Confusion, Urea nitrogen >7 mM, Respiratory rate  $\geq 30$  breaths per min, Blood pressure <90 mmHG (systolic) or  $\leq 60$  mmHg (diastolic), age  $\geq 65$  years) score (strong recommendation, evidence level I).

The authors recommend that the decision to admit or discharge a patient is primarily clinical, and that physicians should also consider

subjective factors, including the ability to take oral medications and family support (strong recommendation, level II evidence).

### Admission versus discharge

The entire management of CAP in terms of diagnostics and therapeutic measures depends on the initial assessment of severity. The authors encourage the use of severity scores, either the PSI score or the CURB-65 score, which take into account objective data. The PSI score relies on 20 objective variables, and has been developed and validated on a large series of patients. It is intended to identify low-risk patients who can safely be treated at home. The CURB-65 score is based on only five objective variables, is designed to identify high-risk patients and has been validated on a smaller case series of subjects. However, CURB-65 is much simpler and easily remembered, and is focused more on severity of illness rather than on the likelihood of mortality. Therefore, the PSI score is preferable for identifying low-risk patients, especially when the emergency department's decision support resources are sufficient, whereas CURB-65 is the preferred score for assessing illness severity. One important limitation of both scores is that they are generated at a single point in time, whereas patient assessment is better obtained in a dynamic fashion over several hours of observation.

A CURB-65 score  $\geq 2$  generally warrants more intensive treatment, *i.e.* hospitalisation or – when appropriate and available – intensive in-home healthcare (moderate recommendation, level III evidence).

### When should I admit my patient to the intensive care unit (ICU)?

- When septic shock is present or mechanical ventilation is needed.
- When severity scores are very high.
- When signs of severe sepsis are present.

ICU admission is a second-level admission decision. The rapid and correct identification of patients requiring ICU/high-level monitoring unit (HLMU) admission would allow:

1. resource optimisation;
2. avoidance of delay in ICU transfer, which has been associated with higher mortality;
3. appropriate diagnostic testing and empirical antimicrobial treatment, since microbial aetiologies differ in these patients and an incorrect initial empiric



The ICU.  
Image: Norbert Kaiser

antimicrobial treatment is associated with increased mortality; and

4. identification of CAP patients who would benefit from immunomodulatory treatment.

The identification of severe CAP is one of the most relevant advances included in these guidelines. Severe CAP carries a very high mortality rate. Patients with severe CAP warrant direct ICU admission if septic shock requiring vasopressor administration and/or acute respiratory failure necessitating mechanical ventilation are present (major criteria; strong recommendation, level II evidence). However, this definition is too narrow and lacks sensitivity, since many patients with CAP who are not in shock or acute respiratory failure are eventually admitted to the ICU. This observation led the authors to revise the minor criteria of CAP severity, adding the CURB-65 criteria and signs of sepsis to the previous minor criteria (see table 1).

ICU/HLMU admission is recommended if patients present with at least three minor criteria among those in table 1.

**Table 1** Criteria for identifying severe CAP

#### Minor criteria<sup>#</sup>

- Respiratory rate  $\geq 30$  breaths per min
- $P_{a,O_2}/F_{I,O_2}$  ratio  $\leq 250^{\ddagger}$
- Multilobar infiltrates
- Confusion/disorientation
- Uraemia (BUN level  $\geq 20$  mg per dL)
- Leukopenia<sup>\*</sup> (WBC count  $< 4,000$  cells per  $mm^3$ )
- Thrombocytopenia (platelet count  $< 100,000$  cells per  $mm^3$ )
- Hypothermia (core temperature  $< 36^\circ C$ )
- Hypotension requiring aggressive fluid resuscitation

#### Major criteria

- Invasive mechanical ventilation
- Septic shock with the need for vasopressors

$P_{a,O_2}$ : arterial oxygen tension;  $F_{I,O_2}$ : inspired oxygen fraction; BUN: blood urea nitrogen; WBC: white blood cell. <sup>#</sup>: Other criteria to consider include hypoglycaemia (in nondiabetic patients), acute alcoholism/alcohol withdrawal, hyponatraemia, unexplained metabolic acidosis or elevated lactate level, cirrhosis and asplenia; <sup>‡</sup>: a need for noninvasive ventilation can substitute for a respiratory rate  $\geq 30$  breaths per min or  $P_{a,O_2}/F_{I,O_2}$  ratio  $\leq 250$ ; <sup>\*</sup>: as a result of infection alone. Reproduced from [1], with permission from the publisher.

## Is microbiological assessment useful?

- Not in primary care.
- Yes in hospitalised patients, especially in severe CAP or when a specific pathogen is suspected, where microbiological results may positively influence the management of CAP.

Microbiological workup is not recommended in an outpatient setting (moderate recommendation, level III evidence).

For in-patients, microbiological assessment is suggested, especially when specific pathogens are suspected on the basis of clinical and epidemiological data (strong recommendation, level II evidence), or when the patient is severely ill (table 2).

The main reasons to perform microbiological workup in the individual patient are the expected likelihood of antibiotic changing and/or improving the likelihood of positive outcomes.

The guidelines refer to a very comprehensive table where microbiological workup is indicated in specific conditions (table 2).

In summary:

- Sputum Gram stain and culture – if productive sputum is available – and blood culture are recommended before treatment in patients belonging to one of the categories listed in table 2 (moderate

recommendation, level I evidence).

- Gram stain may allow both the identification of unusual pathogens not included in the empirical antibiotic treatment and the confirmation of sputum culture results.
- Sputum Gram stain and culture are warranted, especially in necrotising/cavitary pneumonia, frequently caused by community-associated Methicillin-resistant *Streptococcus aureus* (MRSA), and in severe chronic obstructive pulmonary disease (COPD) patients and alcoholics, where *Pseudomonas aeruginosa* and other Gram-negative pathogens are commonly involved. In these patients, a negative Gram stain and culture should allow a safe exclusion of empirical antibiotic coverage for these pathogens.
- In patients with severe CAP, sputum Gram stain and culture, blood culture and urinary antigen tests (UATs) for *Legionella pneumophila* and *Streptococcus pneumoniae* are recommended. Endotracheal aspirate is suggested if the patient is intubated (moderate, level II).
- UATs for *L. pneumophila* and *S. pneumoniae* have been cleared by the US Food and Drug Administration. Sensitivity is greater for Legionella (only serogroup 1, however) than for the pneumococcus antigen (70–90% versus 50–80%, respectively). The major advantage of pneumococcal antigen use is that it is not influenced by previous antibiotic use nor is it influenced in COPD patients with pneumococcal colonisation. The diagnostic yield of the UAT is greater in severe cases, especially in bacteraemic pneumococcal pneumonia.
- Rapid antigen detection for viruses is promising. This test provides important epidemiological information and information on the need for isolation, but sensitivity and specificity are suboptimal.
- Serology for atypical pathogens has only a retrospective value.
- PCR testing for atypicals and other bacteria (e.g. Mycobacterium species) is not yet standardised for use on a large scale.

**Table 2** When to perform more extensive diagnostic tests

Indication	Blood culture	Sputum culture	Legionella UAT	Pneumococcal UAT	Other
ICU admission	✓	✓	✓	✓	✓ <sup>#</sup>
Failure of outpatient antibiotic therapy		✓	✓	✓	
Cavitary infiltrates	✓	✓			✓ <sup>¶</sup>
Leukopenia	✓			✓	
Active alcohol abuse	✓	✓	✓	✓	
Chronic severe liver disease	✓			✓	
Severe obstructive/structural liver disease		✓			
Asplenia (anatomical or functional)	✓			✓	
Recent travel (within past 2 weeks)			✓		✓ <sup>+</sup>
Positive Legionella UAT result		✓ <sup>f</sup>	NA		
Positive pneumococcal UAT result	✓	✓		NA	
Pleural effusion	✓	✓	✓	✓	✓ <sup>§</sup>

UAT: urinary antigen test; NA: not applicable. #: endotracheal aspirate if intubated, possible bronchoscopy or nonbronchoscopic bronchoalveolar lavage; ¶: fungal and tuberculosis cultures; +: see [1] for details; f: special media for Legionella; §: thoracentesis and pleural cultures.

## Special circumstances

- Patients with pleural effusion >5 cm should undergo thoracentesis for fluid analysis, Gram stain and culture.
- The use of invasive diagnostic techniques (bronchoscopic BAL, protected brushing, transthoracic needle aspiration) is

suggested in immunocompromised patients or in those who fail to respond to treatment.

### What initial antimicrobial treatment is recommended?

- Empirical antibiotic treatment varies according to risk factors and severity of the disease (table 3).

### General considerations

- Current recommendations are similar to previous guidelines.
- The authors highlight the importance of combination therapy in severe CAP.
- The recommendations refer to a class of drug, rather than to a specific agent.
- Due to the fear of antibiotic resistance selection, the more potent drug is preferred.

### Special circumstances for in-patients

- Where there is allergy to penicillin, replacement of the  $\beta$ -lactam with

aztreonam is suggested (moderate, level III).

- Community-associated MRSA: the authors suggest the use of vancomycin or linezolid (moderate, level III).
- For suspected *P. aeruginosa* infection, a combination regimen is suggested, until susceptibility is known.
- Pneumococcal bacteraemic pneumonia is more safely treated with combination therapy especially in the most severe patients (ICU).
- Patients with influenza A should be treated with oseltamivir or zanamivir within 48 h (strong, level I). The authors also suggest treating outpatients with influenza with inhaled zanamivir or oral oseltamivir in order to reduce respiratory tract complications.
- Patients presenting with influenza-like syndrome who have been exposed to poultry in H5N1-endemic areas should be tested for H5N1 (moderate, level III),

**Table 3** Initial antimicrobial treatment

Patients	Drugs	Recommendation/ evidence level
<b>Outpatients</b>		
Previously healthy, no risk factors for DRSP	Macrolide (azithromycin, clarithromycin/erythromycin)	Strong/I
	Doxycycline	Weak/III
Comorbidities <sup>#</sup> , antibiotic treatment in last 3 months or other risk factors for DRSP <sup>¶</sup>	Respiratory fluoroquinolone (moxifloxacin, levofloxacin 750 mg)	Strong/I
Penicillin-allergic	$\beta$ -lactam <sup>+</sup> plus a macrolide <sup>1f</sup>	Strong/I
	Respiratory fluoroquinolone (moxifloxacin, levofloxacin 750 mg)	
<b>In-patients</b>		
Non-ICU admission	Respiratory fluoroquinolone (moxifloxacin, levofloxacin 750 mg)	Strong/I
	$\beta$ -lactam <sup>§</sup> plus a macrolide <sup>##¶¶</sup>	Strong/I
ICU admission	$\beta$ -lactam <sup>§</sup> plus fluoroquinolone	Strong/I
	$\beta$ -lactam <sup>§</sup> plus azithromycin	II
ICU admission and <i>P. aeruginosa</i> an issue	Antipneumococcal, antipseudomonas $\beta$ -lactam <sup>++</sup> plus either ciprofloxacin or levofloxacin (750 mg)	Strong/I
	Antipneumococcal, antipseudomonas $\beta$ -lactam <sup>++</sup> plus an aminoglycoside and azithromycin	Moderate/III
	Antipneumococcal, antipseudomonas $\beta$ -lactam <sup>++</sup> plus an aminoglycoside and antipneumococcal, antipseudomonas fluoroquinolone	Moderate/III

DRSP: drug-resistant *S. pneumoniae*; #: chronic heart failure, COPD, chronic kidney or liver disease, diabetes mellitus, cancer, asplenia or immunosuppression; ¶: also in regions with a high prevalence of macrolide-resistant *S. pneumoniae*; +: high-dose amoxicillin (1 g *t.i.d.*) or amoxi/clavulanate (2 g *b.i.d.*), ceftriaxone, cefpodoxime, and cefuroxime (500 mg *b.i.d.*); <sup>f</sup>: or doxycycline (level III evidence); <sup>§</sup>: cefotaxime, ceftriaxone, ampicillin (ertapenem for selected patients); <sup>##</sup>: monotherapy with macrolide is not suggested routinely because of the increasing resistance rate; <sup>¶¶</sup>: macrolides are not recommended if patients have received an antibiotic of this class in the previous 3 months; <sup>++</sup>: piperacillin/tazobactam, cefepime, imipenem, meropenem.

treated with oseltamivir (level II) and covered for *S. pneumoniae* and *S. aureus* (level III). Droplet precautions should be used (moderate, level III).

### Is the recommended empirical antibiotic treatment a panacea for all patients?

No. The suggested regimens are effective for the vast majority of patients, with two important exceptions:

- Pneumonia sustained by drug-resistant *S. pneumoniae* and MRSA.
- Pneumonia sustained by *P. aeruginosa*.

Resistance to empirical antibiotic treatment depends on geography. The best approach to this important issue is the knowledge of local resistance patterns, most reliably by local hospital antibiograms, and the modifications of guidelines accordingly.

Physicians are encouraged to search for epidemiological and clinical risk factors for these pathogens, as outlined in the guidelines [1].

### When should I administer the first antibiotic dose?

- As soon as possible.

The authors recommend administering the first antibiotic as soon as possible after the diagnosis of CAP. For patients who present to an emergency department, it seems reasonable to administer the first dose of antibiotic while still in the department (moderate recommendation, level III evidence).

### When should I switch from i.v. to oral antibiotic? For how long should I treat my patient with antibiotic? When should I discharge my patient?

- Switch to oral therapy when the patient is clinically stable.
- Treat until at least 2–3 days after defervescence.
- Discharge when the patient is clinically stable, comorbidities are treated and social needs are met.

The switch to oral antibiotics is suggested for all patients who are clinically stable and have normal gastrointestinal function (strong recommendation, level II evidence). Table 4 shows the criteria defining clinical stability, which are also useful for discharge.

The authors suggest treating patients with antibiotics for  $\geq 5$  days (level I evidence), provided that the patient is afebrile for 48–72 h,

**Table 4** Criteria defining clinical stability

Temperature $\leq 37.8^\circ\text{C}$
Heart rate $\leq 100$ beats per min
Respiratory rate $\leq 24$ breaths per min
Systolic blood pressure $\geq 90$ mmHg
$\text{Sa,O}_2 \geq 90\%$ or $\text{Po}_2 \geq 60$ mmHg on room air
Ability to maintain oral intake <sup>#</sup>
Normal mental status <sup>#</sup>

<sup>#</sup>: important for discharge or oral switch decision but not necessarily for determination of nonresponse. Reproduced from [1], with permission from the publisher.

and has no more than one sign of clinical instability (moderate recommendation).

The authors suggest a longer treatment if the identified pathogen was not covered by empirical antibiotic therapy, or in case of extrapulmonary complications (weak recommendation, level III evidence).

Discharge is suggested when patients are clinically stable, are able to take oral drugs, comorbidities have been treated and there is no need for additional diagnostic tests, provided that social needs are met.

### What additional treatments are important?

- Treat the patient, not only the infected lung!
- Always search for sepsis; consider a cautious noninvasive ventilation (NIV) trial if respiratory distress is present.

The key factor is that the approach to pneumonia is not only the treatment of an infected lung, but also the management of a patient as a whole, with a special attention to signs and symptoms of sepsis.

Treat the patient in septic shock with adequate fluid resuscitation and, if still nonresponsive, consider the use of drotrecogin  $\alpha$  within 4 h of admission (weak, level II), and test for occult adrenal insufficiency (moderate, level II).

If the patient is hypoxaemic or in respiratory distress, consider a brief and cautious trial of NIV. However, if improvement in respiratory rate,  $\text{Pa,O}_2/\text{Fi,O}_2$  ratio and/or  $\text{Pa,CO}_2$  does not occur within 1–2 h, prompt intubation is warranted, since mortality increases when intubation is preceded by a long NIV trial. Patients with acute respiratory distress syndrome (ARDS) or a  $\text{Pa,O}_2/\text{Fi,O}_2$  ratio  $< 150$  are poor candidates for NIV (moderate recommendation, level I evidence).

Patients intubated for ARDS should be

ventilated with low tidal volume strategy (6 mL per kg of ideal body weight; strong recommendation, level I evidence).

### What should I do if my patient does not respond?

- Identify risk factors for clinical failure and intensify diagnostic workup, if present.
- Search regularly for clinical failure, either early (<72 h) or delayed.
- Use a systematic approach for possible causes.

When a patient shows an inadequate clinical response despite antibiotic treatment, the authors suggest using a systematic classification based on the kind of failure (failure to improve versus deterioration/progression) and the timing of failure (early (<72 h) *versus* delayed; moderate recommendation, level II evidence) [1].

Microbiological assessment in nonresponding pneumonia is critical. The causal identification of failure is easier when initial microbiological work-up results are available; therefore, it is crucial to recognise the presence of risk factors for failure [1], in order to maximise initial diagnostic work-up (table 2).

### Is pneumonia prevention useful and feasible?

- Yes, pneumonia is preventable using vaccination.
- Identify vaccination status on admission, and manage accordingly.

Influenza vaccination has been shown to reduce pneumonia, hospitalisation and death rate. Invasive pneumococcal diseases (bacteraemia and meningitis) are effectively reduced by the use of pneumococcal vaccines among the elderly and subjects with certain chronic medical conditions.

For these reasons, vaccination represents a key factor for the prevention of pneumonia [1], considering also that the use of vaccination in clinical practice is suboptimal.

The US Centers for Disease Control and Prevention recommend annual influenza vaccination with an inactivated vaccine for persons aged  $\geq 50$  years, those at high-risk (*e.g.* chronic cardiovascular and pulmonary disease; chronic renal and metabolic diseases; haemoglobinopathies; immunodeficiency; increased aspiration

risk; pregnancy; long-term facility residence; aspirin therapy if aged  $\leq 18$  years), household contacts of high-risk people and healthcare workers (strong recommendation, level I evidence).

The pneumococcal polysaccharide vaccine is recommended for persons aged  $\geq 65$  years and those at high-risk (strong recommendation, level II evidence).

In patients hospitalised with CAP, vaccination status should be assessed on admission (moderate recommendation, level III evidence), and nonvaccinated at-risk patients should be offered vaccination (moderate recommendation, level III evidence).

Smoking cessation should be offered to patients with pneumonia (moderate recommendation, level III evidence), and pneumococcal and influenza vaccination should be performed in those who do not quit (weak recommendation, level III evidence).

Other measures to reduce the transmission of respiratory pathogens include the prompt notification of cases of pneumonia of public health concern to the local health authority (strong recommendation, level III evidence), and the use of respiratory hygiene measures (hand washing, masks; strong recommendation, level III evidence).

### How should I monitor/audit outcome?

- Use performance indicators and modify your approach according to results.

Quality control plays a crucial role in clinical practice. The authors suggest four performance indicators.

1. Initial empirical antibiotic treatment should be consistent with guidelines.
2. The first treatment dose should be administered in the emergency department.
3. Data on mortality and severity on admission should be recorded, including the number of patients with severe pneumonia initially admitted to a general ward.
4. Data on actual vaccination rate in the at-risk population should be recorded.

A deviation is expected, and should be specified in the clinical chart. Compliance of ~80–95% is considered acceptable.

#### References

1. Mandell LA, Wunderink RG, Anzueto A, et al. *Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults*. *Clin Infect Dis* 2007; 44: Suppl. 2, S27–S72. [Available free of charge online at [www.thoracic.org/sections/publications/statements/pages/mtpi/idsaats-cap.html](http://www.thoracic.org/sections/publications/statements/pages/mtpi/idsaats-cap.html)]
2. American Thoracic Society/Infectious Diseases Society of America. *Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia*. *Am J Respir Crit Care Med* 2005; 171: 388–416.