

An approach to community-acquired pneumonia in adults

Community-acquired pneumonia is an important disease.

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Community-acquired pneumonia (CAP) is an important cause of morbidity and mortality worldwide,^[1] but its incidence in South Africa is unknown. In the USA, the incidence is 5 - 6 cases per 1 000 person-years,^[2] and 60 000 deaths caused by pneumonia were reported in that country in 2005. Given that South Africa is a developing country with a very high HIV prevalence, the incidence and death rate of pneumonia are likely to be higher. High morbidity and mortality rates of up to 23% are associated with CAP in the USA.^[1,2] In South Africa, the rates are not dissimilar.^[3]

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The importance of a rational approach to patients with CAP cannot be overemphasised.

This article discusses important and pertinent aspects of CAP, i.e. the history, physical examination and investigations. An approach to the diagnosis is also presented. The latest South African Thoracic Society (SATS) CAP antibiotic guidelines are summarised in this review.

History

Certain risk factors identified in the history are useful in the diagnosis.^[1,2,4,5] Symptoms such as cough, fever, pleuritic chest pain and dyspnoea are nonspecific and therefore not necessarily useful for diagnostic purposes. A history of recent overseas travel may increase the suspicion index of an infection with the influenza virus, particularly during sporadic outbreaks of influenza or during epidemics. Known HIV infection is associated with opportunistic pathogens (e.g. *Pneumocystis jirovecii*) and *Mycobacterium tuberculosis*, in addition to the common bacterial pathogens such as *Streptococcus pneumoniae*, *Klebsiella pneumoniae* and *Haemophilus influenzae*.

In the immunocompetent patient the presence of extrapulmonary symptoms such as diarrhoea, headache and myalgia suggests infection with the so-called atypical pathogens – *Mycoplasma pneumoniae*, *Chlamydia psittaci* and *Legionella pneumophila* – especially if the symptoms are more prominent than cough and pleuritic chest pain. Patients with co-morbid disease, e.g. diabetes mellitus, chronic obstructive pulmonary disease (COPD), and chronic renal and liver failure, are likely to be infected with Gram-negative organisms such as *Pseudomonas aeruginosa*, *K. pneumoniae* and *Escherichia coli*. A recent history of an influenza-like illness is relevant because of its association with *Staphylococcus aureus* pneumonia. Patients in nursing homes or frail-care facilities tend to be infected with antibiotic-resistant pathogens such as extended spectrum beta-lactamase (ESBL)-producing *K. pneumoniae* and methicillin-resistant *S. aureus* (MRSA). Patients on long-term immunosuppressive

or corticosteroid therapy are at risk of infection with opportunistic pathogens and invasive fungi such as *Aspergillus fumigatus*. Lastly, neutropenic patients are at high risk of developing fungal and staphylococcal pneumonia in addition to pneumonias caused by the common pathogenic organisms alluded to above.

Physical examination

In addition to the respiratory examination, the clinical evaluation must also focus on other tell-tale signs of co-morbid disease, particularly HIV infection. The presence of oral candidosis, melanonychia, generalised lymphadenopathy, wasting, *Molluscum contagiosum* lesions, and hairy leukoplakia are important clinical features to look for in the HIV-positive patient.^[3] Kaposi sarcoma can masquerade as CAP and examination of the skin is therefore important. Special attention should be paid to the patient's age, presence of tachypnoea, confusion, and systolic and diastolic blood pressures. These clinical parameters are important in stratifying patients into mild, moderate or severe CAP using the CURB-65 score (C = confusion; U = urea; R = respiratory rate; B = low blood pressure; age ≥65 years).

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Investigations

A myriad of investigations can be performed in patients with CAP, depending on the clinical circumstances.^[6-8] The chest radiograph (CXR) is the most important investigation to confirm the diagnosis of CAP and may be supplemented by a high-resolution computed tomography (CT) scan of the chest.^[9,10] However, it is important to remember the following:

Community-acquired pneumonia

- A CXR is not necessary to start the patient on treatment. If a diagnosis is suggested from the history and physical examination, treatment should be started without delay.
- The CXR may be normal in a patient with pneumonia, e.g. those who are immunocompromised owing to HIV infection, those with COPD, and those with neutropenia. In patients who present very early on in their illness, the CXR may also be normal. Lastly, an over-penetrated CXR may not show any radiological opacity.

In addition to confirming the diagnosis, the CXR is important for the following reasons:

- To determine the extent of the disease.
- To indicate complications such as pleural and pericardial involvement.
- To limit the spectrum of likely pathogens involved, e.g. pneumatoceles (suggesting *S. aureus*), the bulging fissure of *K. pneumoniae*, or the bat's wing ground-glass appearance of *P. jirovecii*.
- To detect the presence of a primary underlying problem predisposing to pneumonia (e.g. lung cancer, bronchiectasis, or COPD).

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Arterial blood gas determinations are not always necessary unless the patient has signs of severe CAP, such as cyanosis, respiratory rate >30 breaths per minute and confusion. Even in such cases, clinicians may be guided by pulse oximetry – a technique that is widely available in most emergency departments, intensive care units and wards. Sputum should be sent for microscopy, culture and sensitivity (MCS) and for *M. tuberculosis* direct microscopy and culture. If the patient cannot spontaneously produce a good-quality sputum sample, sputum induction with hypertonic saline should be employed or the assistance of the physiotherapy team sought.

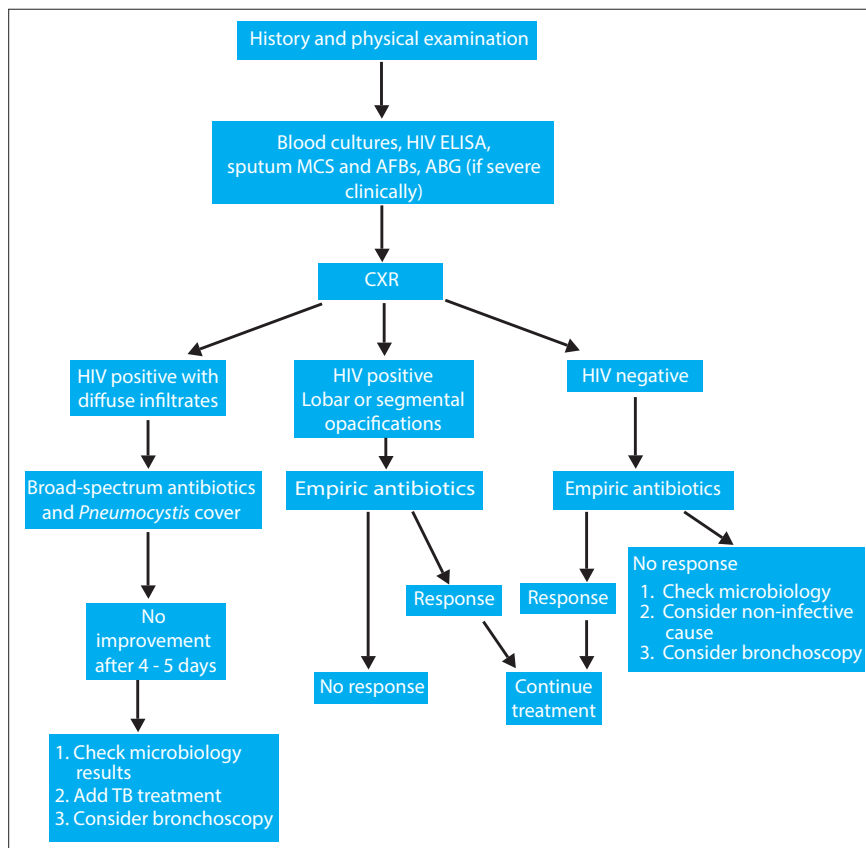


Fig. 1. Simplified diagnostic and treatment algorithm for community-acquired pneumonia. (ELISA = enzyme-linked immunosorbent assay; MCS = microscopy, culture and sensitivity; AFBs = acid-fast bacilli; ABG = arterial blood gas; CXR = chest X-ray; TB = tuberculosis.)

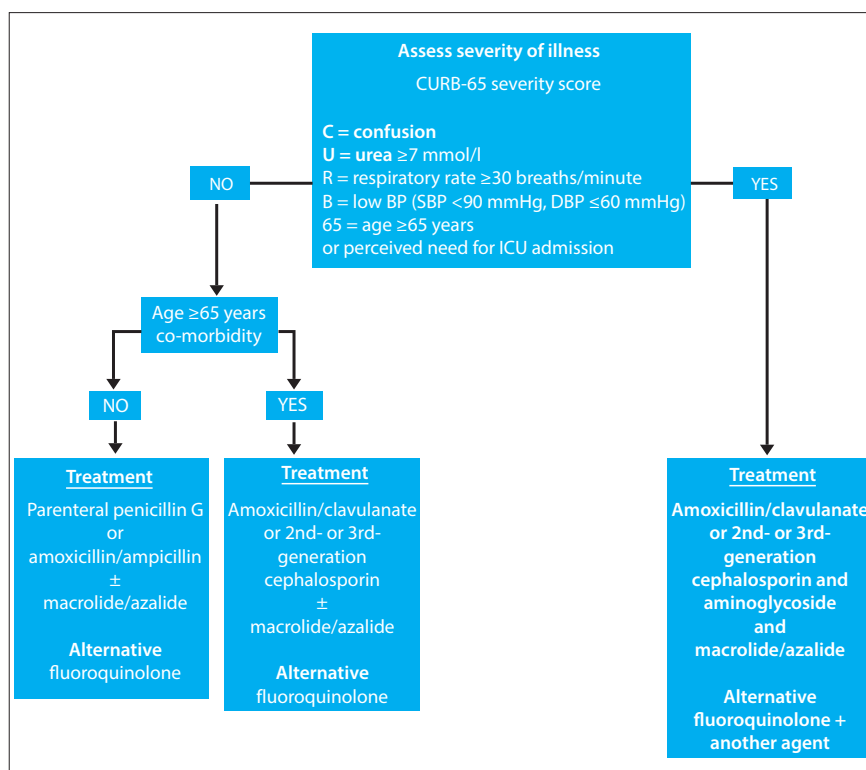


Fig. 2. Antibiotic treatment of community-acquired pneumonia (adapted from SATS Guideline^[14]). (SBP = systolic blood pressure; DBP = diastolic blood pressure; ICU = intensive care unit.)

The following basic laboratory tests may be of value in stratifying patients into severity classes, depending on the preferred scoring system chosen by the managing doctor:

- white blood cell count (very low or very high)
- urea (high)
- sodium (low)
- bilirubin (high).

Recently, biomarker levels, e.g. those of procalcitonin (PCT) and C-reactive protein (CRP), have become important aids in the diagnosis of CAP and are useful for:^[11,12]

- Determining whether the aetiology of CAP is viral, bacterial or mycobacterial. Typically, very high levels of PCT are found in patients with bacterial CAP, and vice versa with viral pneumonias.^[13]
- Assessing severity. Higher levels of PCT may be associated with more severe disease.
- Assessing response to treatment. PCT levels decrease as the patient responds to treatment.

HIV infection should be excluded or confirmed in every patient with CAP. The history is important, but unless a negative test was obtained and confirmed recently all negative patients should be retested. This approach prevents missed opportunities to start treatment early enough to prevent recurrent pneumonia and other complications.

Blood culture tests should be performed on patients with severe to very severe CAP. Legionella and pneumococcal urinary antigen tests are easy and quick to perform and should be done whenever kits for these assays are available.

Treatment

The South African guideline for the antibiotic treatment of CAP,^[14] published in 2007, is also available on the SATS website, and practitioners are encouraged to consult it. This guideline was developed taking into account the unique local circumstances, and gives a simplified approach to the management of CAP (summarised in Figs 1 and 2).

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. [<http://dx.doi.org/10.1086/511159>]
2. Marrie TJ, Huang JQ. Epidemiology of community-acquired pneumonia in Edmonton, Alberta: An emergency department-based study. *Can Respir J* 2005;12:139-142.
3. Nyamande K, Lalloo UG, John M. TB presenting as community-acquired pneumonia in a setting of high TB incidence and high HIV prevalence. *Int J Tuberc Lung Dis* 2007;11(12):1308-1313.
4. Almirall J, Bolibar I, Balanzó X, González CA. Risk factors for community-acquired pneumonia in adults: A population-based case-control study. *Eur Respir J* 1999;13:349-355. [<http://dx.doi.org/10.1183/09031936.99.13234999>]
5. Wunderink RG, Waterer GW. Community-acquired pneumonia: Pathophysiology and host factors with focus on possible new approaches to management of lower respiratory tract infections. *Infect Dis Clin North Am* 2004;18:743-759. [<http://dx.doi.org/10.1016/j.idc.2004.07.004>]
6. Metlay JP, Fine MJ. Testing strategies in the initial management of patients with community-acquired pneumonia. *Ann Intern Med* 2003;138:109-118. [<http://dx.doi.org/10.7326/0003-4819-138-2-200301210-00012>]
7. Marrie TJ. Community-acquired pneumonia. *Clin Infect Dis* 1994;18:501-513. [<http://dx.doi.org/10.1093/clinids/18.4.501>]
8. Baron EJ, Miller JM, Weinstein MP, et al. Executive summary: A guide to utilization of the microbiology laboratory for diagnosis of infectious diseases: 2013 recommendations by the Infectious Diseases Society of America (IDSA) and the American Society for Microbiology (ASM). *Clin Infect Dis* 2013;57:485-488. [<http://dx.doi.org/10.1093/cid/cit441>]
9. Nyamande K, Lalloo UG, Vawda F. Comparison of plain chest radiography and high-resolution CT in human immunodeficiency virus infected patients with community-acquired pneumonia: A sub-Saharan Africa study. *Br J Radiol* 2007;80:302-306. [<http://dx.doi.org/10.1259/bjr/15037569>]
10. Syrjälä H, Broas M, Suramo I, Ojala I, Lähdes S. High-resolution computed tomography for the diagnosis of community-acquired pneumonia. *Clin Infect Dis* 1998;27:358-363. [<http://dx.doi.org/10.1086/514675>]
11. Gilbert DN. Procalcitonin as a biomarker in respiratory tract infection. *Clin Infect Dis* 2011;52(Suppl4):S346-350. [<http://dx.doi.org/10.1093/cid/cir050>]
12. Flanders SA, Stein J, Shochat G, et al. Performance of a bedside C-reactive protein test in the diagnosis of community-acquired pneumonia in adults with acute cough. *Am J Med* 2004;116:529-535. [<http://dx.doi.org/10.1016/j.amjmed.2003.11.023>]
13. Nyamande K, Lalloo UG. Serum procalcitonin distinguishes CAP due to bacteria, *Mycobacterium tuberculosis* and PJP. *Int J Tuberc Lung Dis* 2006;10(5):510-515.
14. Feldman C, Brink AJ, Richards GA, Maartens G, Bateman ED. Management of community-acquired pneumonia in adults. *S Afr Med J* 2007;97(12):1296-1306.

SUMMARY

- CAP in sub-Saharan Africa is a major public health problem associated with considerable morbidity and mortality.
- This is linked to the HIV epidemic.
- A complete history and physical examination are important.
- These must be followed by appropriate investigations, depending on the patient's presentation.
- All patients must be stratified into mild, moderate or severe disease classes and empiric antibiotics administered without delay, preferably while the patient is still in the emergency department.
- As far as possible the SATS guidelines on the management of CAP in adults should be followed.