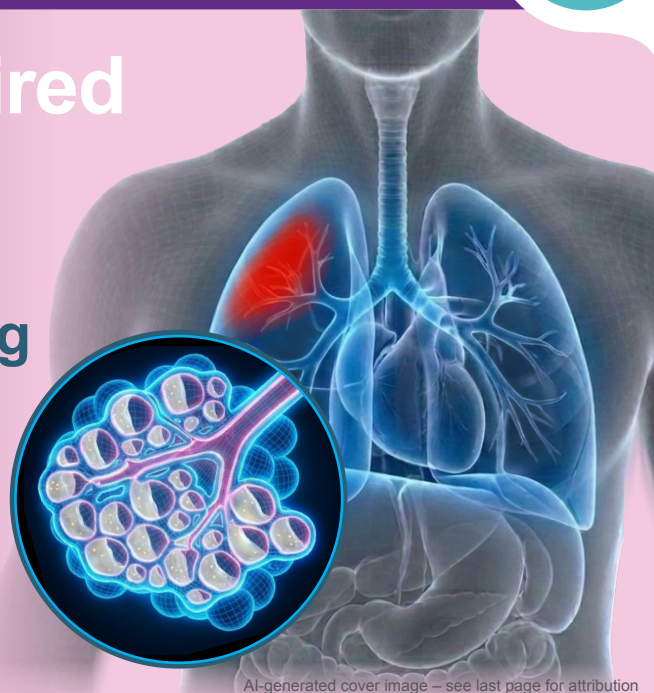




Community-acquired pneumonia

Assessment, diagnosis and antibiotic prescribing



AI-generated cover image – see last page for attribution

Objective	Scope	Target audience
To optimise the management of non-severe community-acquired pneumonia (CAP)	Diagnosis, severity assessment and management of non-severe CAP in adults aged 18 years and older, focusing on appropriate antibiotic therapy for CAP	This clinical guideline is relevant to all healthcare professionals caring for patients with CAP in the community setting, especially those providing primary or generalist care

Pneumonia is a common acute respiratory infection most often affecting adults aged >70 years.¹ In Singapore, pneumonia remains one of the leading causes of morbidity and mortality, accounting for 4.6% of all hospitalisations and 23% of deaths in 2024.^{2,3}

Streptococcus pneumoniae is the most common causative bacterial pathogen for CAP.^{4,5} While penicillin-based antibiotics remain effective treatment options for most patients with CAP, there is increasing prevalence of drug-resistant *S. pneumoniae* internationally^{6,7} and in Singapore.^{8,9} Locally, there is also increasing prevalence of macrolide-resistant *S. pneumoniae* isolates which are frequently resistant to other antibiotics too.^{10,11} Without careful antimicrobial stewardship, multidrug resistance will lead to increased healthcare burden, costs, and adverse events for patients, such as treatment failure, prolonged illness, and mortality.^{12,13}

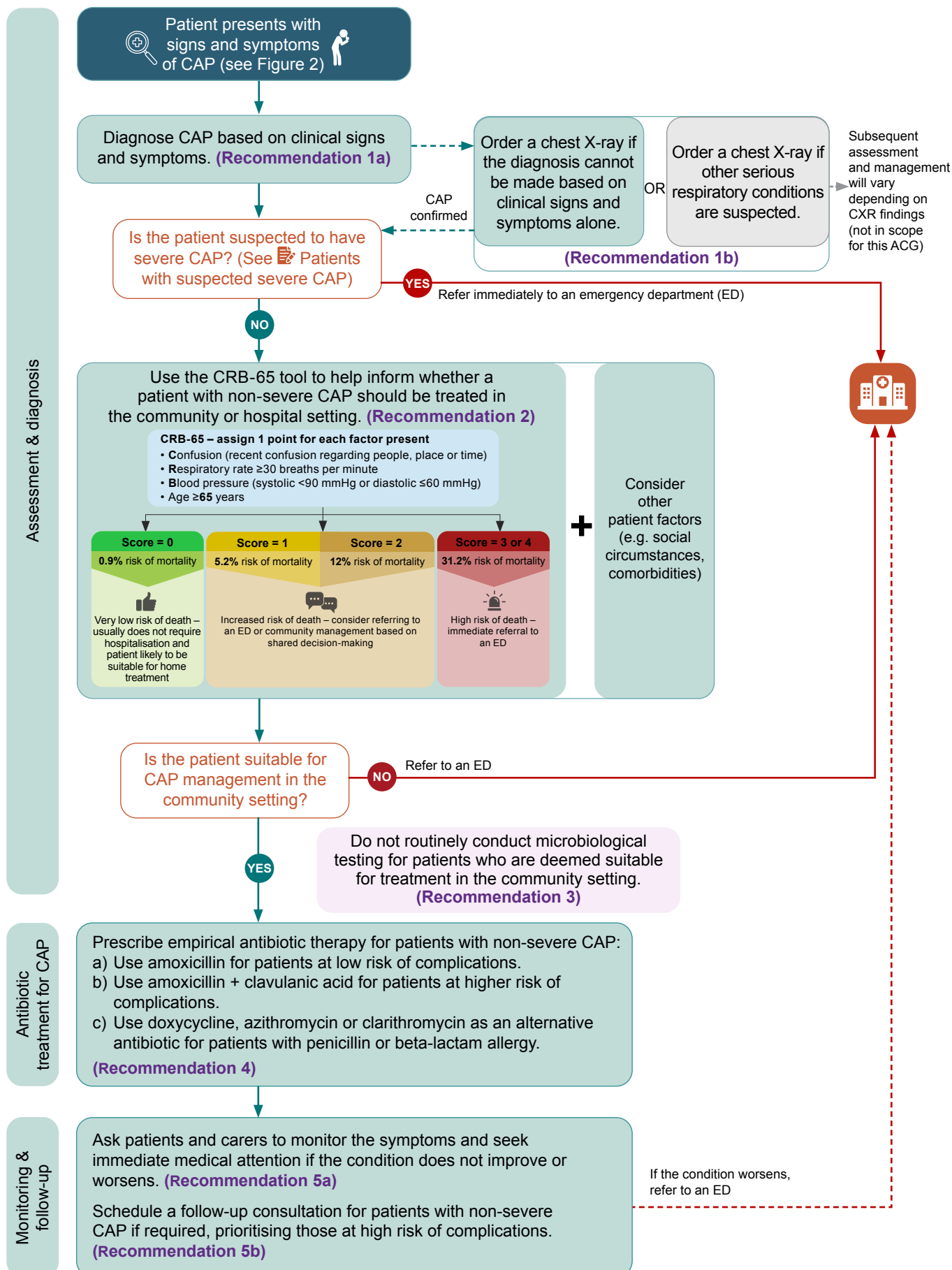
This ACG focuses on CAP^{14,15} and provides evidence-based recommendations for the diagnosis, severity assessment, and appropriate antibiotics management for patients with non-severe CAP treated in the community setting.

Statement of Intent

This ACE Clinical Guideline (ACG) provides concise, evidence-based recommendations and serves as a common starting point nationally for clinical decision-making. It is underpinned by a wide array of considerations contextualised to Singapore, based on best available evidence at the time of development. The ACG is not exhaustive of the subject matter and does not replace clinical judgement. The recommendations in the ACG are not mandatory, and the responsibility for making decisions appropriate to the circumstances of the individual patient remains at all times with the healthcare professional.

Community-acquired pneumonia (CAP) is a common and potentially serious respiratory infection that requires prompt diagnosis and management. The overall approach to diagnosing and managing CAP is summarised in Figure 1. A shared decision-making approach is encouraged throughout the care pathway.

Figure 1: Overall approach to the diagnosis and management of CAP



Assessment and diagnosis

For CAP, prompt initiation of antibiotic treatment can significantly reduce the morbidity, mortality, and overall disease burden.¹⁶⁻¹⁸ Hence, timely and accurate assessment and diagnosis is important to enable prompt treatment initiation.

Recommendation 1a

Diagnose community-acquired pneumonia (CAP) based on clinical signs and symptoms.

Recommendation 1b

Order a chest X-ray if:

- the diagnosis cannot be made based on clinical signs and symptoms alone, or
- other serious respiratory conditions are suspected.

A clinical approach to diagnosis

The diagnosis of CAP can be made based on a combination of presenting signs and symptoms suggestive of pneumonia, obtained during clinical consultation via a thorough patient history and clinical examination. The presenting signs and symptoms can vary among patients.^{19,20}

Figure 2: Examples of signs and symptoms suggestive of CAP

Symptoms	Signs
 • Cough • Sputum production • Dyspnoea • Fatigue • Chills • Pleuritic pain	 • Fever • Tachypnoea (≥ 20 breaths per minute) • Tachycardia (> 100 beats per minute) • Oxygen saturation $< 95\%$ • Pleural rub • Dullness to percussion • Focal signs on auscultation, e.g. crackles, egophony, bronchial breathing

A thorough patient history can also help to strengthen the clinical diagnosis of CAP and inform subsequent management, including strategies to reduce the future risk of CAP (Figure 3).

Figure 3: Examples of patient history relevant to the diagnosis and management of CAP^{17,18,21-23}

Patient history	Clinical relevance
 Chronic comorbidities • Chronic obstructive pulmonary disease (COPD) • Diabetes mellitus • Cardiovascular disease • Chronic liver disease • Chronic renal disease	Associated with increased risk of complications and influences treatment approach (e.g. antibiotic choice)
 Medications associated with increased CAP risk • Proton pump inhibitors • Antipsychotics (first- and second-generation) • Inhaled corticosteroids	Helps explain increased susceptibility; informs risk-benefit discussions and medication review which may lead to adjustments or enhanced monitoring
 Recent healthcare events • Parenteral antibiotic use within the past 3 months, and hospitalisation within the past 3 months • Respiratory syncytial virus (RSV) and influenza infections in the past 30 days	Increases likelihood of antimicrobial-resistant organisms, hence may affect empirical antibiotic selection Increases likelihood of secondary bacterial infection, hence may affect empirical antibiotic selection
 Lifestyle and social factors • Poor nutrition or malnutrition • Tobacco exposure (active or passive) • High alcohol intake • Poor housing conditions (e.g. overcrowding, dampness, mould, poor ventilation) • Incomplete vaccination (e.g. missed pneumococcal vaccination)	Presents opportunities for intervention and long-term prevention (see 'Monitoring and follow-up' section)

Following a clinical diagnosis, check if the patient has any red flags suggestive of severe CAP; red flags require immediate referral to an emergency department (ED) (see  Patients with suspected severe CAP).



Patients with suspected severe CAP

Immediately refer patients with red flags suggestive of severe CAP to an ED for intensive treatment and monitoring. Red flags include:

- Signs of sepsis or septic shock
- Respiratory failure requiring mechanical ventilation

Other signs and symptoms may also point to severe CAP, especially if a cluster of these are observed in a patient. Examples of signs and symptoms that can be clinically assessed without further investigations or tests include tachypnoea (≥ 30 breaths/min), confused or altered mental state, hypothermia (core temperature $< 36^\circ\text{C}$), hypotension requiring aggressive fluid resuscitation, and major organ involvement (e.g. hepatic or renal impairment). Consider if immediate ED referral is warranted; the CRB-65 tool may also assist with this decision (see Recommendation 2).²³⁻²⁶

In the absence of signs and symptoms suggestive of severe CAP, the patient is considered to have non-severe CAP, and the CRB-65 score, applied alongside consideration of other factors and clinical judgement, should be used to guide right-siting of care and appropriate treatment (see Recommendation 2).

Role of chest X-ray in diagnosing CAP

While a chest X-ray (CXR) is not mandatory for diagnosis, it may be warranted if the clinical diagnosis of CAP is uncertain^{27,28} or if there is suspicion of underlying serious respiratory conditions (e.g. tuberculosis, malignancy, parapneumonic effusion, empyema). If CXR is not readily accessible in a primary care setting, a referral to an ED may need to be considered depending on the patient's presenting condition.

The role of CXR may be limited in certain clinical contexts. For example, radiological changes may not be evident in the early phases of infection, or in patients with significant dehydration. CXRs can also have limited utility in differentiating between pneumonia and other conditions such as malignancies or non-infectious pathologies (e.g. organising pneumonia) due to low positive predictive values.²⁹

For pregnant patients in whom CAP diagnosis based on signs or symptoms alone is uncertain or serious underlying respiratory conditions are suspected, consider the potential harms of a CXR to the developing foetus, and discuss the benefits and risks of the CXR with the patient.



CAP in the older population

In older individuals, CAP may present with non-specific signs and symptoms such as confusion, and general clinical deterioration, possibly without typical features like fever, cough, or pleuritic chest pain. Other manifestations include fatigue, weakness, loss of appetite, lethargy, and worsening of functional status or underlying medical conditions.

In such cases, the diagnosis of CAP may not be straightforward or cannot be made based on clinical assessment alone. Hence, a CXR would be beneficial to confirm the diagnosis, or inform the assessment of possible differential diagnoses or complications.

Recommendation 2

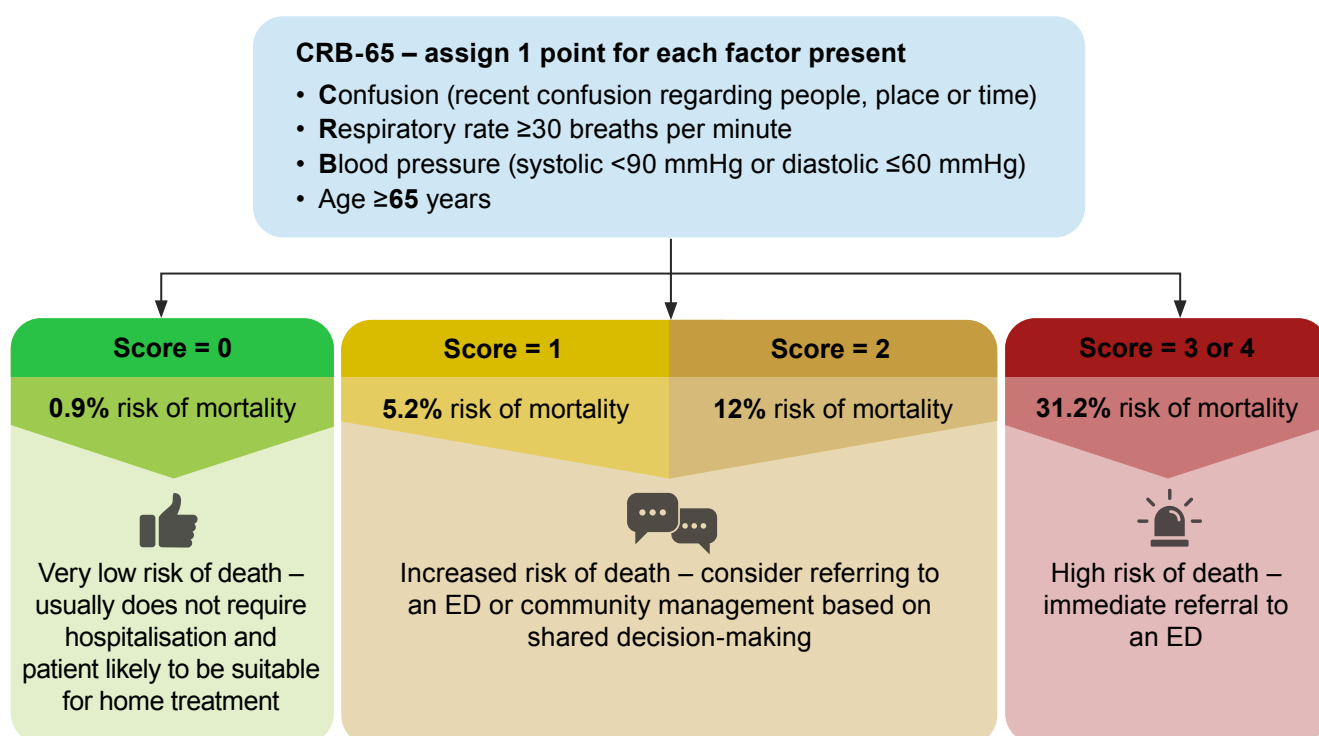
Use the CRB-65 tool to help inform whether a patient with non-severe CAP should be treated in the community or hospital setting.

A patient's risk of severe outcome from CAP (e.g. 30-day mortality) is useful to guide right-siting.²⁴ A number of validated tools are available to determine such risk for patients with CAP, including CURB-65 (Confusion, Urea, Respiratory Rate, Blood Pressure, Age ≥ 65), CRB-65 (Confusion, Respiratory Rate, Blood Pressure, Age ≥ 65), and Pneumonia Severity Index.³⁰

CRB-65 predicts the patient's risk of 30-day mortality to help guide decisions on the appropriate care setting for patients with CAP (i.e. treatment in community vs hospital).^{17,31} It is a simple four-parameter assessment tool (see Figure 4) which can be completed during routine consultation. The CRB-65 is well validated in the primary care setting and provides similar results to CURB-65 without needing to wait for blood urea nitrogen laboratory results. The parameters of the CRB-65 are identical to, and aligned with, a subset of the signs and symptoms used to assess the severity of CAP.

While CRB-65 provides a way to systematically assess the risk of severe disease outcomes from CAP, clinical judgement remains essential. As CRB-65 may overestimate the risk of 30-day mortality, clinicians should evaluate the CRB-65 score within the context of the patient's individual presentation and baseline parameters (e.g. usual diastolic blood pressure reading). Consider factors outside the score too, such as social circumstances, functional status, comorbidities, risk of complications, and patient preferences. Overall, **CRB-65 is best used not as a rigid protocol, but as a clinical decision support tool to complement clinical judgement.**

Figure 4: Risk assessment with CRB-65³¹



Recommendation 3

Do not routinely conduct microbiological testing for patients who are deemed suitable for treatment in the community setting.

Overall, for patients with clinically diagnosed non-severe CAP who are deemed suitable for treatment in the community setting, routine microbiological tests are not necessary for the management of CAP because they play a limited role in supporting initial antibiotic selection (Table 1).^{17,23,32}

Table 1: Microbiological tests to inform management of CAP in the community setting – clinical considerations

Tests	Considerations for patients with CAP treated in the community setting
Blood culture	Not typically required for non-severe CAP due to low diagnostic yield and limited impact on initial antibiotic selection. ^{33,34}
Sputum and respiratory secretions – Gram stain and culture testing	Limited role in supporting initial treatment decisions, and therefore not necessary for the community management of CAP. The results may also be unreliable after antibiotic treatment has commenced. ^{17,23,25,35,36}
Urine antigen tests for <i>Streptococcus pneumoniae</i> (pneumococcus) and <i>Legionella pneumophila</i>	Not required as there are no clear benefits ^{25,37,38} and there is limited evidence to support its usefulness in patients with non-severe CAP. ³⁷
Multiplex polymerase chain reaction (PCR)	Not typically required as it does not usually impact the decision for and duration of antibiotic use. ²⁵



Role of antivirals in patients with CAP and suspected influenza

Influenza and bacterial CAP can co-exist. In non-severe influenza, antivirals are associated with modest benefit in the time to alleviation of symptoms; however, there is no difference in major outcomes such as mortality and hospital admission.³⁹ Overall, the evidence supporting antiviral use in patients with CAP and influenza symptoms is limited, and routine antiviral use for influenza is not recommended. Clinicians should weigh the potential benefits and harms, and engage in shared decision-making with patients.

Antiviral treatment may be more appropriate for high-risk patients with clinically diagnosed CAP who exhibit influenza-like symptoms. High-risk patients include individuals aged ≥ 65 years, and patients with comorbid conditions or chronic metabolic diseases.⁴⁰ The decision to treat should ideally be guided by an influenza test. If testing is unavailable, treatment of high-risk individuals with suspected influenza may be considered on a case-by-case basis. Treatment decisions may also be guided by the level of local influenza activity, accessible via the [Communicable Disease Agency's](#) weekly infectious diseases bulletins.

For more information about influenza testing and use of antivirals, refer to the ACG on [upper respiratory tract infections](#).

Antibiotic treatment for CAP

Recommendation 4

Prescribe empirical antibiotic therapy for patients with non-severe CAP:

- Use amoxicillin for patients at low risk of complications.**
- Use amoxicillin + clavulanic acid for patients at higher risk of complications.**
- Use doxycycline, azithromycin or clarithromycin as an alternative antibiotic for patients with penicillin or beta-lactam allergy.**

As CAP is largely caused by bacterial pathogens, guideline-concordant empirical antibiotic therapy remains the cornerstone of CAP treatment; it is associated with significantly reduced mortality and improved clinical outcomes, and supports efforts to combat antimicrobial resistance.^{41,42}

Choice of antibiotics for empirical treatment of CAP

For best outcomes, start empirical antibiotic therapy soon after the clinical diagnosis of CAP.¹⁸

Table 2 lists the recommended antibiotics, dosing, frequency, and clinical considerations for empirical treatment of patients with non-severe CAP. When choosing an empirical antibiotic for treatment of CAP, consider the following:

- Antibiotic spectrum of activity and coverage against likely pathogen:** *Streptococcus pneumoniae* is the most common causative bacterial pathogen for CAP, followed by other bacteria (e.g. *Haemophilus influenzae*, *Staphylococcus aureus*).^{4,5,43,44} The antibiotics listed in Table 2 provide coverage against these bacteria while abiding by the principle of using the antibiotic with the narrowest spectrum possible to minimise the risk of antibiotic resistance. There is limited evidence to support choosing empirical antibiotics which cover atypical pathogens such as *Legionella pneumophila*, *Mycoplasma pneumoniae* and *Chlamydia pneumoniae*.⁴⁵
- Patient's clinical profile:** General patient characteristics such as allergy status, ability to tolerate antibiotics, or treatment adherence may influence antibiotic choice. Specifically, consider individual patient risk factors for CAP complications^{17,18,20,25} and symptom severity. For patients at higher risk of developing complications (e.g. patients with poorly controlled diabetes mellitus, uncompensated COPD or decompensated liver disease),²⁵ patients with more severe symptoms, or patients with increased likelihood of antimicrobial-resistant organisms (e.g. patients requiring parenteral antibiotics and hospitalisation within the past 3 months), treatment with a broader-spectrum antibiotic or two concurrent antibiotics may be appropriate (see Table 2 for details).

Additional considerations when prescribing antibiotics for the older population

Drug pharmacokinetics and pharmacodynamics can influence clinical response to antibiotic regimens, with side effects and treatment outcomes potentially varying depending on patient age.⁴⁴⁻⁴⁷ Prior to starting antibiotics, assess renal function and hydration status to avoid nephrotoxicity, and consider potential medication interactions.

When prescribing empirical antibiotic treatment:

- Start treatment as soon as possible after CAP is diagnosed to achieve better outcomes.¹⁸
- Ensure an adequate dose is prescribed to avoid sub-therapeutic dosing. Lower doses of amoxicillin (e.g. 500 mg three times daily) were previously standard practice but are now regarded as inadequate by international and local experts, as the pneumococcal minimum inhibitory concentration to penicillin is increasing, hence higher doses of amoxicillin (e.g. 1 g three times daily) are required to overcome increasing resistance.¹⁷
- Prescribe a 3-5-day course for most antibiotics for patients with non-severe CAP unless the patient is not clinically stable or not improving.¹⁸ Evidence indicates that shorter courses of antibiotics (≤5 days) are as effective as longer courses of antibiotics (>5 days).^{40,50-53}

Patient education on empirical antibiotic therapy

To facilitate successful CAP management, educate patients about:

-  The natural course of illness and recovery
-  Maintaining adequate hydration to prevent complications such as nephrotoxicity
-  Adhering to the prescribed antibiotics—taking it at the recommended dose, frequency, and duration, and completing the full course to prevent treatment failure and antibiotic resistance
-  Possible medication side effects, and symptoms and signs of allergy
-  Seeking further care if symptoms worsen or red flags occur

Table 2: Empirical antibiotic choices for adult patients with non-severe CAP^{17,18,20,23,25,40}

Antibiotic, dosage, and duration*	Examples of side effects†
Patients with non-severe CAP who are at low risk of complications (e.g. no or stable comorbidities)	
Amoxicillin † 1g TDS for 3-5 days	<i>Very common/common:</i> Nausea, vomiting <i>Significant:</i> Antibiotic-associated diarrhoea (non- <i>Clostridioides difficile</i>), <i>C. difficile</i> diarrhoea, drug-induced enterocolitis syndrome, hypersensitivity reactions
Patients with non-severe CAP who are at higher risk of complications (e.g. unstable comorbidities)	
Amoxicillin + clavulanic acid ‡§ 875 + 125 mg BD OR 500 + 125 mg TDS for 3-5 days If a broader coverage is needed or an atypical infection is suspected: Amoxicillin + clavulanic acid ‡§ (dosing as above) PLUS Azithromycin † 500 mg OD for 3 days OR 500 mg on Day 1 and 250 mg on Days 2-5 OR Amoxicillin + clavulanic acid ‡§ (dosing as above) PLUS Clarithromycin † 500 mg BD for 5 days	Amoxicillin + clavulanic acid <i>Very common/common:</i> Diarrhoea, nausea, vomiting, skin rash, urticaria, candidiasis <i>Significant:</i> Antibiotic-associated diarrhoea (non- <i>C. difficile</i>), <i>C. difficile</i> infection, drug-induced enterocolitis syndrome, drug-induced liver injury, hypersensitivity reactions Azithromycin <i>Very common/common:</i> Diarrhoea, nausea <i>Significant:</i> <i>C. difficile</i> infection, drug-induced liver injury, hypersensitivity reactions Clarithromycin <i>Common:</i> Dysgeusia, headache, diarrhoea, vomiting, dyspepsia, nausea, abdominal pain, rash
Patients with penicillin or beta-lactam allergy <i>Note: Patient-reported drug allergies are common in clinical practice and it has been reported that most self-reported drug allergies are inaccurate.^{54,55} Similarly, patients with documented or reported penicillin allergy may not have true penicillin allergy and it is advisable to verify the penicillin allergy (e.g. clarify characteristics of past reactions and review documented medication history to check if the patient has previously tolerated penicillin).</i>	
Doxycycline 100 mg BD for 5 days	<i>Very common/common:</i> Abdominal distention, abdominal pain, diarrhoea, xerostomia, vulvovaginal candidiasis <i>Significant:</i> Oesophageal injury, photosensitivity, dental discolouration
Azithromycin † 500 mg OD for 3 days OR 500 mg on Day 1 and 250 mg on Days 2-5	See above
Clarithromycin † 500 mg BD for 5 days	See above
Patients with penicillin or beta-lactam allergy who are at higher risk of complications	
Levofloxacin † 750 mg OD for 5 days ^{50,56**} <i>Note: Levofloxacin should generally be reserved for treatment of active tuberculosis (TB). The use of levofloxacin in patients with undiagnosed TB may mask the symptoms of active TB and delay proper diagnosis and treatment.⁵⁷</i>	<i>Very common/common:</i> Nausea, headache, diarrhoea, insomnia, constipation <i>Significant:</i> Arthropathy/arthritis, central nervous system effects/neuroexcitation, <i>C. difficile</i> infection, hepatotoxicity, hypersensitivity reactions, exacerbation of myasthenia gravis, peripheral neuropathy, phototoxicity, QT prolongation, tendinopathy/tendon rupture
Pregnant patients	
Patients at low risk of complications: Amoxicillin † 1g TDS for 3-5 days (Recommendation 4a) Patients at higher risk of complications: Amoxicillin + clavulanic acid ‡§ 875 + 125 mg BD OR 500 + 125 mg TDS for 3-5 days (Recommendation 4b)	See above <i>Note: Amoxicillin + clavulanic acid have shown no teratogenic effects but may be associated with an increased risk of necrotising enterocolitis in neonates when given near delivery.</i>
Pregnant patients with penicillin or beta-lactam allergy	
Erythromycin † 500 mg QDS for 5 days	<i>Common:</i> Mild gastrointestinal effects <i>Significant:</i> Cholestatic hepatitis
Azithromycin † 500 mg OD for 3 days OR 500 mg on Day 1 and 250 mg on Days 2-5	See above

Medications **bolded** denote availability on government subsidy list at the time of publication. Refer to the [Ministry of Health](#) website for the latest list of subsidised medications. BD, twice daily; OD, once daily; QDS, four times daily; TDS, three times daily

The information in this table is not exhaustive. Refer to medication information resources for details before prescribing.

*Dosing is based on HSA-approved product insert unless otherwise specified. Duration of therapy is based on best practice international guidelines and available evidence.

†The side effects listed are examples of very common or common side effects, or significant side effects, based on product inserts or UpToDate.

‡Azithromycin: caution required if GFR <10mL/min; other ‡ antibiotics: dose adjustment may be required for patients with renal impairment.

§Caution required for patients with hepatic impairment.

**Locally registered dose for nosocomial pneumonia; recommended for CAP by local expert consensus, based on international guidelines and primary studies.

Symptomatic and supportive management

Paracetamol and ibuprofen may be used as needed (unless unsuitable) for symptom management, with clear dosing instructions and maximum daily limits to ensure safe and effective relief of fever, pain, and inflammation.

Monitoring and follow-up

Recommendation 5a

Ask patients and carers to monitor the symptoms and seek immediate medical attention if the condition does not improve or worsens.

Recommendation 5b

Schedule a follow-up consultation for patients with non-severe CAP if required, prioritising those at high risk of complications.

As CAP can be associated with a high mortality risk,^{15,43,58} it is important to monitor treatment response and identify early signs of clinical deterioration. For patients with non-severe CAP, follow-up requirements should be individualised based on the patient's risk of complications and clinical need.

Patient empowerment improves treatment adherence and patient participation in management.⁵⁹ Educate patients about the natural course of illness and recovery, warning signs and symptoms to monitor for, and when to seek escalation of care.

Provide clear advice to patients and carers, emphasising the **importance of seeking immediate medical attention if symptoms worsen** or fail to improve within 3–5 days, or if new concerning symptoms develop such as increased breathlessness, confusion, or inability to maintain oral intake.

Give particular attention to patients at risk of severe disease progression or delayed recovery, including the elderly and those with comorbidities such as diabetes mellitus. During the initial assessment, it is advisable to schedule follow-up consultations for these high-risk patients to ensure timely intervention.

During follow-up consultations for these patients:

- **Reassess the patient's clinical status**, focusing on the progress of overall signs and symptoms, and functional capacity.
- **Do not routinely use C-reactive protein or procalcitonin** to monitor treatment response because of limited benefits in acute infections; access may also be limited in some primary care settings.
- **Consider if a (repeat) CXR is clinically indicated**. Most patients with CAP are expected to recover well and will not require a CXR to monitor treatment response. However, for some patients, CXR may be indicated at follow up (e.g. if CAP does not improve or worsens, or for patients with an abnormal CXR such as effusion or atelectasis at diagnosis).
- **Refer to a specialist** if underlying conditions such as malignancy are suspected.
- **Encourage the uptake of strategies to address modifiable risk factors** (Figure 3), for example:
 - o Recommend appropriate vaccinations, such as pneumococcal and influenza vaccines (refer to the [National Adult Immunisation Schedule](#) (NAIS) for the recommended list of vaccinations and [MOH circular](#) for advice on COVID-19). Where necessary, provide patient education regarding the role of immunisation to reduce complications (e.g. reduce mortality in the older population).⁶⁰ Explore [HealthHub](#) for more information on pneumococcal vaccine.
 - o Discuss smoking cessation where relevant and avoidance of secondary smoke exposure, as these factors significantly impact respiratory health and recovery from pneumonia.

Importantly, **reassess the suitability of the treatment setting during the follow-up consultation**. If the patient shows signs of clinical deterioration, inadequate response to treatment, or development of complications, refer to an ED.

References

Click or scan the QR code for the reference list to this clinical guideline



Evidence-to-Recommendation Framework

Click or scan the QR code to view the rationale underpinning the recommendations in this clinical guideline



Google Gemini was used to portray the anatomy of the lower respiratory tract with potential areas of inflammation during a community-acquired pneumonia infection. (Google Gemini, accessed, March 2026)

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About the Agency

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