



Pneumonia (community-acquired): antimicrobial prescribing

NICE guideline

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Your responsibility

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

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Overview

This guideline sets out an antimicrobial prescribing strategy for adults, young people, children and babies aged 72 hours and over with a confirmed diagnosis of community-acquired pneumonia. It aims to optimise antibiotic use and reduce antibiotic resistance.

See a [3-page visual summary](#) of the recommendations, including tables to support prescribing decisions.

See the [NICE guideline on pneumonia in adults](#) for other recommendations on diagnosis and management, including microbiological tests.

For managing other lower respiratory tract infections, including hospital-acquired pneumonia and acute cough, see our web page on [respiratory conditions](#).

NICE has also produced a guideline on [antimicrobial stewardship: systems and processes for effective antimicrobial medicine use](#).

Who is it for?

- Healthcare professionals
- People with community-acquired pneumonia, their families and carers

Recommendations

1.1 *Managing community-acquired pneumonia*

Treatment for adults, young people and children

- 1.1.1 Offer an antibiotic(s) for adults, young people and children with community-acquired pneumonia. When choosing an antibiotic (see the recommendations on [choice of antibiotic](#)), take account of:
- the severity assessment for adults, as set out in the [NICE guideline on pneumonia in adults](#)
 - the severity of symptoms or signs^[1] for children and young people, based on clinical judgement
 - the risk of developing complications, for example, if the person has relevant comorbidity such as severe lung disease or immunosuppression
 - local antimicrobial resistance and surveillance data (such as flu and *Mycoplasma pneumoniae* infection rates)
 - recent antibiotic use
 - recent microbiological results, including colonisation with multidrug-resistant bacteria.
- 1.1.2 Start antibiotic treatment as soon as possible after establishing a diagnosis of community-acquired pneumonia, and certainly within 4 hours (within 1 hour if the person has suspected sepsis and meets any of the high risk criteria for this – see the [NICE guideline on sepsis](#)).
- 1.1.3 Give oral antibiotics first line if the person can take oral medicines, and the severity of their condition does not require intravenous antibiotics.
- 1.1.4 If intravenous antibiotics are given, review by 48 hours and consider switching to oral antibiotics if possible.
- 1.1.5 For adults with community-acquired pneumonia, follow the recommendations on microbiological tests in the [NICE guideline on pneumonia in adults](#).

- 1.1.6 For children and young people in hospital with community-acquired pneumonia, and severe symptoms or signs or a comorbidity, consider sending a sample (for example, sputum sample) for microbiological testing.

Advice

- 1.1.7 Give advice to adults, young people and children with community-acquired pneumonia about:
- possible adverse effects of the antibiotic(s)
 - how long symptoms are likely to last (see also the NICE guideline on pneumonia in adults)
 - seeking medical help (if the person is receiving treatment in the community) if:
 - symptoms worsen rapidly or significantly or
 - symptoms do not start to improve within 3 days or
 - the person becomes systemically very unwell.

Reassessment

- 1.1.8 Reassess adults, young people and children with community-acquired pneumonia if symptoms or signs do not improve as expected or worsen rapidly or significantly.
- 1.1.9 When reassessing adults, young people and children with community-acquired pneumonia, be aware of possible non-bacterial causes, such as flu.
- 1.1.10 If a sample has been sent for microbiological testing:
- review the choice of antibiotic(s) when results are available and
 - consider changing the antibiotic(s) according to results, using a narrower-spectrum antibiotic, if appropriate.
- 1.1.11 Send a sample (for example, a sputum sample) for microbiological testing if symptoms or signs have not improved following antibiotic treatment, and this has not been done already.

Referral and seeking specialist advice

1.1.12 Refer adults with community-acquired pneumonia to hospital as set out in the [NICE guideline on pneumonia in adults](#), or if they have:

- any symptoms or signs suggesting a more serious illness or condition (for example, cardiorespiratory failure or sepsis) or
- symptoms that are not improving as expected with antibiotics.

1.1.13 Consider referring adults with community-acquired pneumonia to hospital, or seek specialist advice, if they:

- have bacteria that are resistant to oral antibiotics or
- cannot take oral medicines (exploring locally available options for giving intravenous antibiotics at home or in the community, rather than in hospital, if this is appropriate).

1.1.14 Consider referring children and young people with community-acquired pneumonia to hospital, or seek specialist paediatric advice on further investigation and management.

See the evidence and committee discussion on [antibiotic prescribing strategies](#) and [choice of antibiotics](#).

1.2 Choice of antibiotic

1.2.1 When prescribing an antibiotic(s) for community-acquired pneumonia:

- follow table 1 for adults aged 18 years and over
- follow table 2 for children and young people under 18 years.

Table 1 Antibiotics for adults aged 18 years and over

Antibiotic ¹	Dosage and course length ²
First-choice oral antibiotic if low severity (based on clinical judgement and guided by CRB65 score 0, or CURB65 score 0 or 1) ³	

Amoxicillin	500 mg 3 times a day (higher doses can be used – see BNF) for 5 days ⁴
Alternative oral antibiotics if low severity, for penicillin allergy or if amoxicillin unsuitable (for example, atypical pathogens suspected⁵)³	
Doxycycline	200 mg on first day, then 100 mg once a day for 4 days (5-day course in total) ⁴
Clarithromycin	500 mg twice a day for 5 days ⁴
Erythromycin (in pregnancy)	500 mg 4 times a day for 5 days ⁴
First-choice oral antibiotics if moderate severity (based on clinical judgement and guided by CRB65 score 1 or 2, or CURB65 score 2); guided by microbiological results when available³	
Amoxicillin <i>with (if atypical pathogens suspected⁵):</i>	500 mg 3 times a day (higher doses can be used – see BNF) for 5 days ⁴
Clarithromycin ⁶ <i>or</i>	500 mg twice a day for 5 days ⁴
Erythromycin ⁶ (in pregnancy)	500 mg 4 times a day for 5 days ⁴
Alternative oral antibiotics if moderate severity, for penicillin allergy; guided by microbiological results when available³	
Doxycycline	200 mg on first day, then 100 mg once a day for 4 days (5-day course in total) ⁴
Clarithromycin	500 mg twice a day for 5 days ⁴
First-choice antibiotics if high severity (based on clinical judgement and guided by CRB65 score 3 or 4, or CURB65 score 3 to 5); guided by microbiological results when available³	
Co-amoxiclav <i>with:</i>	500/125 mg 3 times a day orally or 1.2 g 3 times a day IV ⁷ for 5 days ⁴
Clarithromycin <i>or</i>	500 mg twice a day orally or IV ⁷ for 5 days ⁴
Erythromycin (in pregnancy)	500 mg 4 times a day orally for 5 days ⁴
Alternative antibiotic if high severity, for penicillin allergy; guided by microbiological results when available³	
Levofloxacin ⁸ (consider safety issues)	500 mg twice a day orally or IV ⁷ for 5 days ⁵
Consult local microbiologist if fluoroquinolone not appropriate.	

¹ See [BNF](#) for appropriate use and dosing in specific populations, for example, hepatic impairment, renal impairment, pregnancy and breastfeeding, and administering intravenous (or, where appropriate, intramuscular) antibiotics.

² Oral doses are for immediate-release medicines.

³ Give oral antibiotics first line if the person can take oral medicines, and the severity of their condition does not require intravenous antibiotics.

⁴ Stop antibiotic treatment after 5 days unless microbiological results suggest a longer course is needed or the person is not clinically stable (fever in past 48 hours or more than 1 sign of clinical instability [systolic blood pressure <90 mmHg, heart rate >100/minute, respiratory rate >24/minute, arterial oxygen saturation <90% or PaO₂ <60 mmHg in room air]).

⁵ *Mycoplasma pneumoniae* infection occurs in outbreaks approximately every 4 years.

⁶ Consider adding a macrolide to amoxicillin if atypical pathogens suspected. Review when microbiological results available.

⁷ Review intravenous antibiotics by 48 hours and consider switching to oral antibiotics if possible.

⁸ See [Medicines and Healthcare products Regulatory Agency \(MHRA\) advice](#) for restrictions and precautions for using fluoroquinolone antibiotics because of very rare reports of disabling and potentially long-lasting or irreversible side effects affecting musculoskeletal and nervous systems. Warnings include: stopping treatment at first signs of a serious adverse reaction (such as tendonitis), prescribing with special caution for people over 60 years and avoiding coadministration with a corticosteroid (March 2019).

Abbreviations: BNF, British national formulary; [CRB65](#), confusion, respiratory rate ≥30/minute, low systolic [<90 mmHg] or diastolic [≤60 mmHg] blood pressure, age ≥65; [CURB65](#), confusion, urea >7 mmol/l, respiratory rate ≥30/minute, low systolic [<90 mmHg] or diastolic [≤6 mmHg] blood pressure, age ≥65; IV, intravenous; PaO₂, partial pressure of oxygen.

Table 2 Antibiotics for children and young people under 18 years

Antibiotic ¹	Dosage and course length ²
Children under 1 month	
Refer to paediatric specialist.	
Children aged 1 month and over	
First-choice oral antibiotic if non-severe symptoms or signs (based on clinical judgement) ³	

Amoxicillin	1 month to 11 months, 125 mg 3 times a day for 5 days ⁴ 1 year to 4 years, 250 mg 3 times a day for 5 days ⁴ 5 years to 17 years, 500 mg 3 times a day for 5 days ⁴ (higher doses can be used for all ages – see BNF for children)
Alternative oral antibiotics if non-severe symptoms or signs (based on clinical judgement), for penicillin allergy or if amoxicillin unsuitable (for example, atypical pathogens suspected⁵)³	
Clarithromycin	1 month to 11 years: Under 8 kg, 7.5 mg/kg twice a day for 5 days ⁴ 8 kg to 11 kg, 62.5 mg twice a day for 5 days ⁴ 12 kg to 19 kg, 125 mg twice a day for 5 days ⁴ 20 kg to 29 kg, 187.5 mg twice a day for 5 days ⁴ 30 kg to 40 kg, 250 mg twice a day for 5 days ⁴ 12 years to 17 years: 250 mg to 500 mg twice a day for 5 days ⁴
Erythromycin (in pregnancy)	8 years to 17 years, 250 mg to 500 mg 4 times a day for 5 days ⁴
Doxycycline ⁶	12 years to 17 years, 200 mg on first day, then 100 mg once a day for 4 days (5-day course in total) ⁴
First-choice antibiotic(s) if severe symptoms or signs (based on clinical judgement); guided by microbiological results when available³	
Co-amoxiclav	Oral doses: 1 month to 11 months, 0.5 ml/kg of 125/31 suspension 3 times a day for 5 days ⁴ 1 years to 5 years, 10 ml of 125/31 suspension 3 times a day or 0.5 ml/kg of 125/31 suspension 3 times a day for 5 days ^{4,7} 6 years to 11 years, 10 ml of 250/62 suspension 3 times a day or 0.3 ml/kg of 250/62 suspension 3 times a day for 5 days ⁴ 12 years to 17 years, 500/125 mg 3 times a day for 5 days ⁴ IV doses ⁸ : 1 month to 2 months, 30 mg/kg 2 times a day ⁴ 3 months to 17 years, 30 mg/kg 3 times a day (maximum 1.2 g per dose 3 times a day) ⁴

With (if atypical pathogen suspected⁵):	
Clarithromycin or	Oral doses: see above for clarithromycin; for 5 days ⁴ IV doses ⁸ : 1 month to 11 years, 7.5 mg/kg twice a day (maximum 500 mg per dose) ⁴ 12 years to 17 years, 500 mg twice a day ⁴
Erythromycin (in pregnancy)	See oral dose above for erythromycin; for 5 days ⁴
Alternative antibiotics if <u>severe symptoms or signs</u> (based on clinical judgement), for penicillin allergy; guided by microbiological results when available³	
Consult local microbiologist.	
<p>¹ See BNF for children for appropriate use and dosing in specific populations, for example, hepatic impairment, renal impairment, pregnancy and breastfeeding, and administering intravenous (or, where appropriate, intramuscular) antibiotics.</p> <p>² Oral doses are for immediate-release medicines. The age bands apply to children of average size and, in practice, the prescriber will use the age bands in conjunction with other factors such as the severity of the condition being treated and the child's size in relation to the average size of children of the same age.</p> <p>³ Give oral antibiotics first line if the person can take oral medicines, and the severity of their condition does not require intravenous antibiotics.</p> <p>⁴ Stop antibiotic treatment after 5 days unless microbiological results suggest a longer course length is needed or the person is not clinically stable.</p> <p>⁵ <i>Mycoplasma pneumoniae</i> infection occurs in outbreaks approximately every 4 years and is more common in school-aged children.</p> <p>⁶ See BNF for children for use of doxycycline in children under 12.</p> <p>⁷ Or 5 ml of 250/62 suspension.</p> <p>⁸ Review intravenous antibiotics by 48 hours and consider switching to oral antibiotics if possible.</p> <p>Abbreviations: BNFC, British national formulary for children; IV, intravenous.</p>	

See the committee discussions on [choice of antibiotics](#) and [antibiotic course length](#).

^[1] At the time of publication (September 2019), no validated severity assessment tools are available for children and young people with community-acquired pneumonia, and severity of symptoms or

signs should be based on clinical judgement.

Terms used in the guideline

Severity assessment in adults

The [NICE guideline on pneumonia in adults](#) recommends that healthcare professionals use clinical judgement along with CRB65 or CURB65 score to assess the severity of community-acquired pneumonia.

Severe community-acquired pneumonia in children and young people

Features of severe community-acquired pneumonia in children and young people include difficulty breathing, oxygen saturation <90%, raised heart rate, grunting, very severe chest indrawing, inability to breastfeed or drink, lethargy and a reduced level of consciousness.

CRB65

CRB65 is used in primary care to assess 30-day mortality risk in adults with pneumonia. The score is calculated by giving 1 point for each of the following prognostic features: confusion, respiratory rate ≥ 30 /minute, low systolic [< 90 mmHg] or diastolic [≤ 60 mmHg] blood pressure, age ≥ 65). Risk of death is stratified as follows:

- 0: low risk (less than 1% mortality risk)
- 1 or 2: intermediate risk (1% to 10% mortality risk)
- 3 or 4: high risk (more than 10% mortality risk).

CURB65

CURB65 is used in hospital to assess 30-day mortality risk in adults with pneumonia. The score is calculated by giving 1 point for each of the following prognostic features: (confusion, urea > 7 mmol/l, respiratory rate ≥ 30 /minute, low systolic [< 90 mmHg] or diastolic [≤ 60 mmHg] blood pressure, age ≥ 65). Risk of death is stratified as follows:

- 0 or 1: low risk (less than 3% mortality risk)
- 2: intermediate risk (3% to 15% mortality risk)
- 3 to 5: high risk (more than 15% mortality risk).

Adults with score of 1 and particularly 2 are at increased risk of death (should be considered for hospital referral) and people with a score of 3 or more are at high risk of death (require urgent hospital admission).

Summary of the evidence

This is a summary of the evidence. For full details, see the [evidence review](#).

- Community-acquired pneumonia is a lower respiratory tract infection that is most commonly caused by bacterial infection ([British Thoracic Society \[BTS\] guideline on community-acquired pneumonia in adults, 2009](#)).
- The main bacterial pathogen is *Streptococcus pneumoniae* ([NICE clinical knowledge summaries \[CKS\] on chest infections in adults, 2015](#)), however *Mycoplasma pneumoniae* occurs in outbreaks approximately every 4 years in the UK and is much more common in school-aged children (BTS 2009).
- Although bacterial infection is the most common cause of community-acquired pneumonia, viral infection causes approximately 13% of cases in adults (BTS 2009) and approximately 66% of cases in children and young people (Jain et al. 2015).
- Low-severity, community-acquired pneumonia in adults includes people with pneumonia severity index (PSI) score of I or II, [CRB65](#) score 0 or [CURB65](#) score 0 or 1. Moderate- to high-severity, community-acquired pneumonia in adults includes people with PSI score of III to V, [CRB65](#) score 1 to 4 or [CURB65](#) score 2 to 5.
- The severity of infection was not always clearly defined in the studies, and was often based on clinical judgement. The management setting (community or hospital) was used to indicate the severity of symptoms when this was not described in the studies (through either severity assessment scores or clinical judgement).

Antibiotic prescribing strategies

- In adults with moderate- to high-severity community-acquired pneumonia, an antibiotic prescribing strategy guided by results of pneumococcal and *Legionella pneumophila* urine antigen tests was not significantly different from a strategy that used broad-spectrum antibiotics without antigen testing for the outcomes of mortality, clinical relapse and hospital admissions (1 randomised controlled trial [RCT], [Falguera et al. 2009](#)).
- In adults with mixed severity community-acquired pneumonia, a strategy of stopping antibiotics based on guidelines was not different to physician-guided stopping for a range of outcomes, including mortality, symptoms, recurrence, length of hospital stay and adverse events. Stopping antibiotics based on guidelines was associated with a longer total antibiotic course length (including intravenous and oral antibiotics) but with a shorter time taking

- intravenous antibiotics (2 RCTs, [Uranga et al. 2016](#) and [Aliberti et al. 2017](#)).
- In children aged 1 month to 5 years with severe community-acquired pneumonia, a strategy of intravenous antibiotics then switching to oral antibiotics (based on a specified drop in body temperature and stable clinical signs) reduced hospital stay by about 1 day, compared with standard care (intravenous then switching to oral antibiotics at least 48 hours after dissipation of fever). There was no difference in readmissions (1 non-inferiority RCT, [In-iw et al. 2015](#)).

Committee discussions on antibiotic prescribing strategies

- The committee discussed that the study designs were not appropriate for determining which antibiotic prescribing strategies were most effective, because the antibiotics used in the studies on prescribing strategies had very broad antibacterial cover.
- The committee discussed that although community-acquired pneumonia can be caused by a viral infection, it is difficult to distinguish this from a bacterial infection. Based on the high mortality rate, the committee agreed that all people with community-acquired pneumonia should be offered an antibiotic.
- The committee was aware that the NICE guideline on pneumonia in adults (2014) recommends antibiotic treatment as soon as possible, and within 4 hours for people admitted to hospital with community-acquired pneumonia. The committee agreed that this was also applicable to people receiving treatment in the community. The committee also agreed that people with suspected sepsis and high risk criteria (as described in the NICE guideline on sepsis) would need more urgent treatment.
- Because there were no major differences between stopping antibiotics based on guidelines and stopping antibiotics based on clinical judgement, the committee agreed that clinical judgement should be used when deciding when to stop antibiotic treatment. This should usually be after 5 days.
- The committee agreed that the criteria (fever in the past 48 hours, blood pressure, heart rate, respiratory rate and oxygen saturations) used in the study by Uranga et al. (2016) should be considered during decision making (see the committee discussion on [antibiotic course length](#)).
- The committee discussed the evidence in children suggesting a reduced length of hospital stay with switching from intravenous to oral antibiotics when clinical signs were stable compared with switching following 48 hours of dissipation of fever. However, because other important clinical outcomes were not reported (such as mortality or cure), and no evidence was available in adults for this prescribing strategy, the committee agreed that if applicable, the decision for switching from intravenous to oral antibiotics in adults, young people and children should be based on clinical judgement (see the evidence summary and committee discussion section on [route of administration](#)).
- In children and young people with severe symptoms or signs, the committee agreed that a broad-spectrum antibiotic would be needed initially to cover the range of possible pathogens, including the addition of a macrolide if atypical pneumonia was suspected (see

- the committee discussion on [choice of antibiotics](#)).
- The committee was concerned about the risk of antimicrobial resistance from using broad-spectrum antibiotics for longer than necessary. Therefore, the committee agreed that in children and young people in hospital, with severe symptoms or signs or a comorbidity (who were more likely to be on broad-spectrum antibiotics), sending a sample for microbiological testing should be considered. They recognised that obtaining a sample for testing is not always possible, especially in young children.
- The committee agreed that when microbiological results are available, the antibiotic should be reviewed and changed accordingly (for example, if bacteria are found to be resistant or atypical pathogens are not isolated) if symptoms are not already improving, using a narrower-spectrum antibiotic if appropriate.
- The committee agreed that first-line antibiotics would be effective in most children and young people with non-severe symptoms or signs, and therefore microbiological testing would not be needed routinely to guide antibiotic choice.

Choice of antibiotics

Efficacy of antibiotics

Low-severity community-acquired pneumonia in adults

- There were no differences in the clinical effectiveness of the following antibiotic comparisons (course length varied but usually ranged from 7 to 14 days) in adults with low-severity community-acquired pneumonia:
 - clarithromycin compared with amoxicillin ([Pakhale et al. 2014](#))
 - clarithromycin compared with erythromycin (Pakhale et al. 2014)
 - azithromycin compared with clarithromycin (Pakhale et al. 2014)
 - azithromycin compared with co-amoxiclav ([Paris et al. 2008](#))
 - azithromycin compared with levofloxacin (Pakhale et al. 2014)
 - a cephalosporin (cefuroxime or cefditoren) compared with co-amoxiclav ([Maimon et al. 2008](#))

- – levofloxacin compared with ceftriaxone plus azithromycin ([Raz-Pasteur et al. 2015](#)).
- Some differences were seen for some efficacy outcomes for other antibiotic comparisons in adults with low-severity community-acquired pneumonia.
 - Amoxicillin improved clinical cure rates (in intention-to-treat analysis only) and complete resolution at 30 days, compared with phenoxymethylpenicillin ([Llor et al. 2017](#)).
 - Cefixime significantly reduced respiratory rate, radiological consolidations and bacterial isolates compared with ciprofloxacin, but there was no significant differences in temperature reduction or pulse rate ([Ige et al. 2015](#)).

Evidence for efficacy of antibiotics for low-severity community-acquired pneumonia in adults is based on 3 systematic reviews ([Pakhale et al. 2014](#), [Maimon et al. 2008](#) and [Raz-Pasteur et al. 2015](#)), 1 RCT ([Ige et al. 2015](#)) and 2 non-inferiority RCTs ([Llor et al. 2017](#) and [Paris et al. 2008](#)).

Moderate- to high-severity community-acquired pneumonia in adults

- There were no differences in the clinical effectiveness of the following antibiotic comparisons (course length varied but usually ranged from 7 to 14 days) in adults with moderate- to high-severity community-acquired pneumonia:
 - a macrolide compared with antibiotics targeted at non-atypical pathogens (penicillins, beta-lactam plus beta-lactamase inhibitors, cephalosporins and carbapenems; [Eliakim-Raz et al. 2012](#))
 - a fluoroquinolone compared with antibiotics targeted at non-atypical pathogens (penicillins, beta-lactam plus beta-lactamase inhibitors and cephalosporins; [Eliakim-Raz et al. 2012](#))
 - levofloxacin compared with tigecycline ([Nemeth et al. 2015](#))
 - levofloxacin compared with doxycycline ([Nemeth et al. 2015](#))
 - ofloxacin compared with erythromycin ([Skalsky et al. 2013](#))
 - moxifloxacin compared with levofloxacin ([Yuan et al. 2012](#))
 - ertapenem compared with ceftriaxone ([Bai et al. 2014](#))
 - a macrolide compared with a beta-lactam antibiotic plus macrolide ([Raz-Pasteur et al.](#)

- – [2015](#))
 - a fluoroquinolone compared with a beta-lactam antibiotic plus fluoroquinolone (Raz-Pasteur et al. 2015)
 - ceftriaxone plus azithromycin compared with ceftriaxone plus a macrolide (clarithromycin or erythromycin; [Tamm et al. 2007](#))
 - ceftobiprole compared with ceftriaxone plus linezolid (in suspected methicillin-resistant *Staphylococcus aureus* [MRSA] infection ([Nicholson et al. 2012](#))).
- For other antibiotic comparisons in adults with moderate- or high-severity community-acquired pneumonia, some differences were seen in some efficacy outcomes:
 - Antibiotics targeted at atypical pathogens (macrolides and fluoroquinolones) compared with antibiotics targeted at non-atypical pathogens (penicillins, beta-lactam plus beta-lactamase inhibitors, cephalosporins and carbapenems): overall there were no significant differences in mortality or clinical failure, but there was significantly less bacteriological failure with antibiotics targeted at atypical pathogens. Some minor differences were seen in subgroup analyses, including significantly lower clinical failure with antibiotics targeted at atypical pathogens in adults with *Legionella pneumophila* infection (Eliakim-Raz et al. 2012).
 - Ceftriaxone compared with ceftaroline fosamil: there was no significant difference in mortality, but clinical cure was significantly increased with ceftriaxone ([El Hajj et al. 2017](#)).
 - A fluoroquinolone (levofloxacin or moxifloxacin) compared with a beta-lactam antibiotic plus macrolide: there were no significant differences in mortality or microbiological failure, but clinical failure was significantly reduced with a fluoroquinolone (result not significant in adults with pneumococcal pneumonia; Raz-Pasteur et al. 2015).
 - A beta-lactam antibiotic (co-amoxiclav or cefuroxime) plus upfront clarithromycin (upfront dual therapy) compared with a beta-lactam antibiotic (co-amoxiclav or cefuroxime) plus clarithromycin only when a positive *Legionella pneumophila* urine sample was confirmed (test-dependant dual therapy): there was no significant difference in mortality or clinical stability; in people with an atypical (but not non-atypical) infection, upfront dual therapy was significantly better for achieving clinical stability compared with test-dependant dual therapy; there were no significant differences in admission to intensive care, incidence of complicated pleural effusion, length of hospital stay or long-term readmission rates.

Evidence for efficacy of antibiotics for moderate-to high-severity community-acquired pneumonia in adults is based on 7 systematic reviews (Eliakim-Raz et al. 2012, Nemeth et al. 2015, Skalsky et al. 2013, El Hajj et al. 2017, Yuan et al. 2012, Bai et al. 2014 and Raz-Pasteur et al. 2015) and 3 non-inferiority RCTs (Garin et al. 2014, Nicholson et al. 2012 and Tamm et al. 2007).

Non-severe community-acquired pneumonia in children and young people

- Evidence (1 systematic review, [Lodha et al. 2013](#)) was identified on the following antibiotic comparisons (course length varied but usually ranged from 4 to 10 days) for treatment of non-severe community-acquired pneumonia, for which no significant differences were found for the efficacy outcomes reported:
 - azithromycin compared with erythromycin
 - azithromycin compared with co-amoxiclav
 - clarithromycin compared with erythromycin
 - co-trimoxazole compared with amoxicillin
 - cefpodoxime compared with co-amoxiclav
- For other antibiotic comparisons in children and young people with non-severe community-acquired pneumonia, some differences were seen in the following efficacy outcomes:
 - Co-amoxiclav was significantly better than amoxicillin for improving cure rate (94% versus 60%) and improving poor or no response rate (2% versus 20%) in children aged 2 to 12 years.
 - Amoxicillin was significantly better than chloramphenicol for improving cure rate in children aged 2 to 59 months.

Severe community-acquired pneumonia in children and young people

- Evidence ([Lodha et al. 2013](#) unless otherwise stated) was identified on the following antibiotic comparisons for treatment (course length varied but usually ranged from 3 to 10 days) of severe or very severe community-acquired pneumonia in children and young people, for which no significant differences were found for the outcomes reported:
 - amoxicillin compared with an unspecified penicillin
 - amoxicillin compared with ampicillin

- - amoxicillin compared with cefuroxime
 - amoxicillin compared with clarithromycin
 - levofloxacin compared with beta-lactam antibiotics (co-amoxiclav or ceftriaxone)
 - cefuroxime compared with clarithromycin
 - co-trimoxazole compared with chloramphenicol
 - ceftaroline fosamil compared with ceftriaxone ([Cannavino et al. 2016](#)).
 - benzylpenicillin plus gentamicin compared with co-amoxiclav
 - an unspecified penicillin plus chloramphenicol compared with ampicillin
 - benzylpenicillin plus chloramphenicol compared with chloramphenicol
 - an unspecified penicillin plus gentamicin compared with chloramphenicol
 - chloramphenicol plus an unspecified penicillin compared with ceftriaxone
 - ceftriaxone plus vancomycin compared with ceftaroline fosamil ([Blumer et al. 2016](#)).
- For other antibiotic comparisons in children and young people with severe community-acquired pneumonia, some differences were seen in the following efficacy outcomes:
 - Ampicillin plus gentamicin was significantly better than chloramphenicol in children with very severe pneumonia, aged 2 to 59 months for clinical failure at all time points, but there was no significant difference in mortality. Significantly fewer children given ampicillin plus gentamicin needed to change antibiotics before day 21.
 - A penicillin (unspecified) plus gentamicin was not significantly different to chloramphenicol for mortality in children with severe community-acquired pneumonia, aged 1 to 59 months, but readmissions were significantly lower with a penicillin plus gentamicin.

Evidence for efficacy of antibiotics for severe community-acquired pneumonia in children and young people is based on 1 systematic review (Lodha et al. 2013) and 2 RCTs (Cannavino et al. 2016 and Blumer et al. 2016).

Safety of antibiotics

- Antibiotic-associated diarrhoea is estimated to occur in 2% to 25% of people taking antibiotics, depending on the antibiotic used ([NICE CKS on diarrhoea – antibiotic associated](#)).
- About 10% of the general population claim to have a penicillin allergy; this is often because of a skin rash that occurred while taking a course of penicillin as a child. Fewer than 10% of people who think they are allergic to penicillin are truly allergic. See the [NICE guideline on drug allergy](#) for more information.
- People with a history of immediate hypersensitivity to penicillins may also react to cephalosporins and other beta-lactam antibiotics ([BNF, August 2019](#)).
- Macrolides should be used with caution in people with a predisposition to QT interval prolongation ([BNF, August 2019](#)).
- Tetracyclines, including doxycycline, can deposit in growing bone and teeth (by binding to calcium) causing staining and occasionally dental hypoplasia. They should not be given to pregnant or breastfeeding women, and use in children under 12 years is either contraindicated or cautioned for use in severe or life-threatening infections where there are no alternatives ([BNF, August 2019](#)).
- Fluoroquinolones have restrictions and precautions around their use because of rare reports of disabling and potentially long-lasting or irreversible side effects affecting musculoskeletal and nervous systems ([MHRA Drug Safety Update, March 2019](#)). They may also be associated with a small increased risk of aortic aneurysm and dissection, particularly in older people ([MHRA Drug Safety Update, November 2018](#)).
- Tendon damage (including rupture) has been reported rarely in people receiving fluoroquinolones ([BNF, August 2019](#)).
- Overall, adverse effects of antibiotics were similar in the studies, although some differences were seen for the following antibiotic comparisons in people with community-acquired pneumonia:
 - Adverse events were significantly higher with azithromycin compared with levofloxacin (19.9% versus 12.3%) and erythromycin compared with clarithromycin (45.7% versus 21.4%; Pakhale et al. 2014), and abdominal pain was significantly worse with azithromycin compared with co-amoxiclav (9.6% versus 1.5%; Paris et al. 2008), in adults with low-severity community-acquired pneumonia.

- – Adverse events, treatment discontinuations and diarrhoea were significantly lower with a fluoroquinolone compared with beta-lactam antibiotic plus a macrolide in adults with moderate- to high-severity community-acquired pneumonia ([Raz-Pasteur et al. 2015](#)).
- Adverse events were significantly lower with a macrolide compared with a beta-lactam antibiotic plus macrolide in adults with moderate- to high-severity community-acquired pneumonia ([Raz-Pasteur et al. 2015](#)).
- Adverse events were significantly higher with ceftobiprole compared with ceftriaxone plus linezolid in adults with suspected MRSA infection ([Nicholson et al. 2012](#)).
- Adverse events were significantly lower with azithromycin compared with co-amoxiclav in children with non-severe community-acquired pneumonia ([Lodha et al. 2013](#)).
- Significantly more children with severe community-acquired pneumonia had 1 or more adverse events with ceftriaxone plus vancomycin compared with ceftaroline fosamil ([Blumer et al. 2016](#)).
- See the [summaries of product characteristics](#) for information on contraindications, cautions, drug interactions and adverse effects of individual medicines.

Committee discussions on choice of antibiotics

- The committee noted that using the care setting as a proxy for the severity of community-acquired pneumonia may not always be appropriate, and that some studies in outpatients may include people with moderate-severity community-acquired pneumonia, or a mixed severity population. They recognised that hospital admission criteria in other countries may differ from UK practice.
- The committee discussed the pathogens which cause community-acquired pneumonia and noted that *Streptococcus pneumoniae* is the most common cause. Based on their experience, the committee noted that atypical pathogens are the causative organism in around 10% to 15% of moderate- to high-severity infections.

Adults with community-acquired pneumonia

- The committee discussed the evidence on choice of antibiotics in adults with low-severity community-acquired pneumonia and in adults with moderate- to high-severity community-acquired pneumonia.
- The committee was aware that the CRB65 (in primary care) and CURB65 (in hospital) mortality risk scores are recommended in the NICE guideline on pneumonia in adults for assessing the risk of mortality with community-acquired pneumonia. The committee discussed evidence which used the pneumonia severity index to assess severity; however, they agreed that CRB65 and CURB65 scores should be used in conjunction with clinical judgement to assess severity in adults, as this is currently routine practice.
- Based on limited evidence showing no major differences in clinical effectiveness between antibiotics or classes of antibiotics, the committee agreed that the choice of antibiotic should largely be driven by their experience of which antibiotics have good activity against likely pathogens and cause the least harm, with as narrow spectrum as possible to minimise the risk of antimicrobial resistance. The committee considered the adverse effects associated with individual antibiotics, for example, increased risk of *Clostridium difficile* infection, along with the risk of harm from not adequately treating the infection.
- Based on their experience, the **first-choice antibiotic** for adults with low-severity community-acquired pneumonia is **amoxicillin** (a penicillin), which has good activity against *Streptococcus pneumoniae* and is associated with fewer adverse effects and relatively low resistance rates. Amoxicillin is routinely used as first-line treatment and the committee agreed that there was no evidence to support changing current practice.

- **Alternative antibiotics** are **doxycycline** (a tetracycline), **clarithromycin** (a macrolide) and **erythromycin** (an alternative macrolide in pregnancy), for people with low-severity community-acquired pneumonia and penicillin allergy, or when amoxicillin may not be appropriate, for example, if an atypical infection is suspected. These antibiotics have good activity against *Streptococcus pneumoniae*; however, because of their broader spectrum of activity (and because some of them also have additional safety warnings), the committee agreed that these antibiotics should be used only when there is a clinical reason not to use amoxicillin.
- Although evidence for doxycycline was not identified in people with low-severity community-acquired pneumonia, the committee agreed that evidence identified in hospitalised adults could include a mixed severity population. From its experience, the committee agreed that doxycycline is an appropriate choice as an alternative to a macrolide.
- The committee discussed the evidence of effectiveness for azithromycin. However, it agreed that because of its long half-life and therefore increased likelihood of resistance, it was a less suitable choice than other macrolides.
- From its experience, the committee agreed that although the available evidence does not differentiate between people with moderate-severity disease and those with high-severity disease, there is a clinical distinction between these groups which require different treatment options. Therefore, separate recommendations on antibiotic choice were made for moderate-severity and high-severity community-acquired pneumonia.
- The committee recognised that there was not clear evidence that the addition of a macrolide to amoxicillin was effective for treating moderate- to high-severity community-acquired pneumonia in adults, although this was current routine practice. However, the committee had concerns about the consistency and quality of the evidence identified.
- Based on their experience, the **first-choice antibiotic** for adults with moderate-severity community-acquired pneumonia is **amoxicillin** (a penicillin), with the addition of a macrolide if an atypical pathogen is suspected. Choices of macrolides are **clarithromycin** or **erythromycin** (in pregnancy). The committee based this decision on its experience of current practice, and because dual therapy with amoxicillin plus a macrolide provides broader spectrum of activity which is more likely to target atypical pathogens. In this population when the causative pathogen is not known, the risk of adverse effects and increased antimicrobial resistance with dual therapy is likely to be outweighed by the

- clinical benefit.
- Based on its experience, the committee agreed that if dual therapy with amoxicillin plus a macrolide is given to people with moderate-severity community-acquired pneumonia, this should be reviewed when microbiological results are available. Microbiological results may be useful to guide a decision to stop the macrolide, helping to reduce the risk of resistance and adverse effects with dual therapy.
- **Alternative antibiotics** for adults with moderate-severity community-acquired pneumonia and penicillin allergy are **doxycycline** (a tetracycline) or **clarithromycin** (a macrolide) alone. This is based on the committee's experience that these antibiotics have good activity against *Streptococcus pneumoniae*, as well as atypical infections. The committee noted that there are no reasonable alternatives for dual therapy in adults who are unable to take a penicillin, for example, due to penicillin allergy.
- The committee discussed evidence that fluoroquinolone monotherapy (levofloxacin or moxifloxacin) was as effective as beta-lactam plus macrolide dual therapy for people with moderate- to high-severity community-acquired pneumonia. However, they noted the safety concerns with fluoroquinolones, such as tendon damage and aortic aneurysm. The committee noted that the licence is restricted in community-acquired pneumonia, and agreed that fluoroquinolones should only be used when other medicines cannot be prescribed or have been ineffective.
- The committee agreed that if first and alternative antibiotic choices are not appropriate for adults with low- or moderate-severity community-acquired pneumonia, clinical judgement or seeking specialist advice from a local microbiologist is appropriate.
- Based on its experience, the **first-choice antibiotic** for adults with high-severity community-acquired pneumonia is **co-amoxiclav** (a penicillin with a beta-lactamase inhibitor) **with clarithromycin** or **erythromycin** (in pregnancy). This provides broad-spectrum gram-negative cover and cover for atypical pathogens. The high risk of mortality in this population outweighs the potential adverse effects and increased risk of antimicrobial resistance with broad-spectrum antibiotics.
- The **alternative antibiotic** for adults with high-severity community-acquired pneumonia and penicillin allergy is **levofloxacin**. The committee discussed the evidence of effectiveness for levofloxacin and recognised that *Legionella pneumophila* infection is more common in this population. The committee agreed that the high risk of mortality without appropriate treatment in this population outweighs the safety concerns and therefore agreed that

- levofloxacin monotherapy is an appropriate alternative.
- The committee discussed the evidence that doxycycline is as effective as levofloxacin for adults with moderate- to high-severity community-acquired pneumonia. However, the evidence for doxycycline comes from 1 small study with a 0% mortality rate, suggesting this is not a high-severity population. Therefore, the committee agreed that there is insufficient evidence to recommend doxycycline for this population.
- The committee agreed that people with high-severity community-acquired pneumonia and penicillin allergy, in whom a fluoroquinolone is not appropriate, is likely to be a small population and specialist microbiological advice should be sought.

Children and young people with community-acquired pneumonia

- The committee was not aware of any validated severity assessment tools for children and young people with community-acquired pneumonia. The committee agreed that features which suggest severe community-acquired pneumonia in children and young people include difficulty breathing, oxygen saturation <90%, raised heart rate, grunting, very severe chest indrawing, inability to breastfeed or drink, lethargy and reduced level of consciousness. The severity of symptoms and signs should be assessed by clinical judgement, taking into account these features.
- Based on the evidence identified and its experience, the committee agreed that it was appropriate to make separate recommendations for non-severe and severe community-acquired pneumonia.
- Given the specialist expertise needed for treatment of children under 1 month with community-acquired pneumonia, the committee agreed that these children should have their treatment managed by a paediatric specialist.
- Overall, the committee agreed there was limited evidence relevant to UK practice, and that the evidence had major limitations.
- Therefore, the committee agreed that the choice of antibiotics in children and young people should largely be driven by its experience of which antibiotics have good activity against likely pathogens and cause the least harm, with as narrow spectrum as possible to minimise the risk of antimicrobial resistance.
- The committee discussed evidence that co-amoxiclav was more effective than amoxicillin for children with non-severe community-acquired pneumonia. However, the committee

- noted that this was based on 1 small RCT within a systematic review, and a lower than expected response rate to amoxicillin was reported compared with other studies in children, which may have been due to sub-therapeutic dosing.
- Based on their experience, the **first-choice antibiotic** for children and young people with community-acquired pneumonia and non-severe symptoms or signs is **amoxicillin**, which is effective against the most common causative pathogens and is well tolerated. The committee also recognised the clinical experience of the effectiveness of amoxicillin in children and young people, and its common use in current practice.
- **Alternative antibiotics** are **clarithromycin**, **erythromycin** (in pregnancy) and **doxycycline** for children and young people with non-severe symptoms or signs and penicillin allergy, or if amoxicillin is unsuitable (for example, if an atypical pathogen is suspected). These antibiotics have good activity against *Streptococcus pneumoniae*; however, because of their broader spectrum of activity, the committee agreed that these antibiotics should only be used when there is a clinical reason not to use amoxicillin.
- The committee agreed that if first and alternative antibiotic choices are not appropriate for children and young people with non-severe community-acquired pneumonia, clinical judgement or seeking specialist advice from a local microbiologist is appropriate.
- The committee highlighted that the evidence identified for children and young people with severe community-acquired pneumonia was conducted in low-income countries, where severe pneumonia may be more common. The committee was aware that children with severe community-acquired pneumonia in the UK will usually have underlying respiratory conditions. Therefore, the evidence identified may not be directly relevant to UK practice.
- Based on its experience, the **first-choice antibiotic** for children and young people with severe community-acquired pneumonia is **co-amoxiclav**, with the addition of **clarithromycin** or **erythromycin** (in pregnancy) if an atypical pathogen is suspected. The committee discussed that children and young people with severe symptoms or signs are likely to be at higher risk of treatment failure with amoxicillin, and therefore need broader-spectrum antibiotics to target a range of possible causative organisms. Antibiotics to cover atypical pathogens should also be available if atypical infection is suspected. In this population when the causative pathogen is not known, the risk of adverse effects and increased antimicrobial resistance with dual therapy is likely to be outweighed by the clinical benefit.
- The committee agreed that children and young people with severe community-acquired pneumonia and penicillin allergy is likely to be a small population and specialist

- microbiological advice should be sought.

Safety netting for all people with community-acquired pneumonia

- The committee recognised that community-acquired pneumonia is potentially a life-threatening infection and that a person's condition may change rapidly.
- The committee agreed that advice should be given to adults, young people and children about:
 - the possible adverse effects of the antibiotic **and**
 - how long symptoms are likely to last as set out in the NICE guideline on pneumonia **and**
 - seeking medical help (if the person is receiving treatment in the community) if symptoms worsen rapidly or significantly, do not start to improve within 3 days, or they become systemically very unwell.
- They agreed that adults, young people and children should be reassessed if symptoms or signs do not improve as expected or worsen rapidly or significantly. If symptoms or signs have not improved following antibiotic treatment, a microbiological sample should be sent for testing if this has not been done already to help guide further treatment. The committee was aware that obtaining a microbiological sample may not always be possible.
- The committee was aware that community-acquired pneumonia can be caused by a viral infection and therefore agreed that during reassessment, non-bacterial causes of community-acquired pneumonia, such as infection with flu, should be taken into account.
- The committee was aware of recommendations from NICE guidelines on pneumonia in adults and sepsis that cover when to refer people to hospital.
- The committee agreed by consensus that adults with any symptoms or signs suggesting a more serious illness or condition or, with symptoms that are not improving as expected with antibiotics, should be referred to hospital if they are being treated in the community.
- The committee recognised that not all children and young people need to have their treatment managed in hospital, and referral should be based on clinical judgement because no evidence was identified. They agreed that community-acquired pneumonia is less common in children and young people, and that referral to hospital should be considered, or

- specialist paediatric advice on further investigation and management should be sought.
- The committee also agreed by consensus that referral or seeking specialist advice should be considered for adults with community-acquired pneumonia who have bacteria that are resistant to oral antibiotics, or who cannot take oral antibiotics (to explore locally available options for giving intravenous antibiotics at home or in the community, rather than in hospital, if this is appropriate).

Antibiotic dosage

- Low-dose antibiotics were not significantly different from high-dose antibiotics for any clinical or bacteriological outcomes reported, in adults with low-severity community-acquired pneumonia:
 - levofloxacin 500 mg once a day compared with levofloxacin 750 mg once a day; 1 non-inferiority RCT, [Zhao et al. 2016](#)).
 - co-amoxiclav 875/125 mg three times a day compared with co-amoxiclav 2000/125 mg twice a day, including in a subgroup analysis of adults with atypical pathogens, *S. pneumoniae* or *H. influenzae* infection (1 non-inferiority RCT, [Siquier et al. 2006](#)).
- Low-dose amoxicillin (45 mg/kg/day divided into 3 doses) was not significantly different to high-dose amoxicillin (90 mg/kg/day divided into 3 doses) for clinical improvement in young children (2 to 59 months) with non-severe community-acquired pneumonia (1 non-inferiority RCT, [Hazir et al. 2007](#)).
- Amoxicillin given twice a day (total 50 mg/kg/day) was not significantly different to amoxicillin given three times a day at the same dose (total 50 mg/kg/day) for clinical failure rates in young children (2 to 59 months) with non-severe community-acquired pneumonia (1 non-inferiority RCT, [Vilas-Boas et al. 2014](#)).
- Low-dose benzylpenicillin (200,000 IU/kg/day divided into 4 doses) was not significantly different to high-dose benzylpenicillin (400,000 IU/kg/day divided into 4 doses) for duration of hospital stay, duration of intravenous treatment or C-reactive protein levels in young children (3 months to 15 years) with severe community-acquired pneumonia (1 RCT, [Amarilyo et al. 2014](#)).
- No evidence from systematic reviews or RCTs was identified in adults with moderate- or high-severity community-acquired pneumonia.

Committee discussions on antibiotic dosage

- Based on evidence showing no differences between low-dose and high-dose antibiotics, and its experience, the committee agreed that usual BNF doses for community-acquired pneumonia (or respiratory tract infections) should be used. However, they recognised the importance of consulting [BNF](#), [BNF for children](#) and [MHRA advice](#) for appropriate use and dosing in specific populations, for example, hepatic impairment, renal impairment, pregnancy and breastfeeding, and for information on administering intravenous antibiotics.
- The committee noted that no evidence was identified in adults with moderate- or high-severity community-acquired pneumonia, and only 1 small RCT in young children with severe community-acquired pneumonia was identified. Based on its experience and the higher risk of mortality in people with a severe infection, the committee agreed that where a range of doses are given, the higher dose is appropriate for these people.
- Based on clinical experience and evidence in adults with low-severity community-acquired pneumonia that high-dose erythromycin is associated with more adverse effects, the committee agreed that the usual BNF dose for erythromycin should be used when this is recommended as an option for women and young women aged 8 years and over who are pregnant.

Antibiotic course length

- Short-course antibiotics (3 to 7 days) were not significantly different to long-course antibiotics (10 to 14 days) for mortality or clinical failure in adults with low- to moderate-severity community-acquired pneumonia (1 systematic review, [Li et al. 2007](#)).
- Short-course amoxicillin (3 days) was not significantly different to long-course amoxicillin (8 days) for clinical cure, bacteriological or radiological success, and length of hospital stay, in adults with low- to moderate-severity community-acquired pneumonia (1 RCT, [El Moussaoui et al. 2006](#)).
- Short-course antibiotics (amoxicillin or co-trimoxazole for 3 days) were not significantly different to a 5-day course of the same antibiotic for clinical cure or relapse, in young children (2 to 59 months) with non-severe community-acquired pneumonia. The same results were seen when amoxicillin and co-trimoxazole were analysed separately (1 systematic review, [Haider et al. 2008](#)).
- Short-course amoxicillin (3 days) was significantly worse than a 10-day course of amoxicillin (at

- the same dose) for treatment failure (4/10 versus 0/56) in young children (6 to 59 months) with non-severe community-acquired pneumonia (1 RCT, [Greenberg et al. 2014](#)).
- Short-course amoxicillin (5 days) was not significantly different to a 10-day course of amoxicillin (at the same dose) for treatment failure in young children (6 to 59 months) with non-severe community-acquired pneumonia. However, C-reactive protein at day 5 to 7 was significantly worse with the 5-day course (1 RCT, [Greenberg et al. 2014](#)).
- No evidence from systematic reviews or RCTs was identified in adults or children with severe community-acquired pneumonia.

Committee discussions on antibiotic course length

- The committee agreed that the shortest course that is likely to be effective should be prescribed to reduce the risk of antimicrobial resistance and minimise the risk of adverse effects. However, an effective course length is important in community-acquired pneumonia because this can be a life-threatening infection.
- The committee discussed evidence for antibiotic course length in adults, young people and children with community-acquired pneumonia. Overall, there did not appear to be major differences between short- and long-course antibiotics, but they noted some inconsistency in the evidence for adults and children. It was also aware that no evidence was identified in children and young people with severe community-acquired pneumonia.
- The committee agreed that there were several limitations which reduced the applicability of the evidence to UK practice (for example, evidence on antibiotic comparisons not recommended or available in the UK, or a lack of critical outcome reporting).
- The committee noted the Uranga et al. (2016) study carried out in adults, which found that antibiotics given for a minimum of 5 days, with a strategy of stopping treatment if fever was absent for 48 hours, and there was no more than 1 associated sign of clinical instability, was not different to usual physician's practice. It also noted a similar study (Aliberti et al. 2017), also carried out in adults, which found that antibiotics given for a minimum for 5 days, with a strategy of stopping treatment if clinically stable for 48 hours, was not different to usual physician practice. (See the committee discussion on [antibiotic prescribing strategies](#).)
- Based on its experience and the risks of antimicrobial resistance with longer courses, the committee agreed by consensus that a 5-day course of recommended antibiotics was appropriate to treat community-acquired pneumonia for adults, young people and children.
- However, the committee did recognise that in some individual circumstances a longer course may be required, and noted that the evidence excluded some high-severity and high-risk populations, for example adults in intensive care, infected with an uncommon pathogen or with immunosuppression. Therefore, in adults, it agreed that antibiotic treatment should be stopped at 5 days unless microbiology results suggest infection with a pathogen which may require a longer course length, or the person is not clinically stable (presence of fever within 48 hours or more than 1 sign of clinical instability based on blood pressure, heart rate, respiratory rate and oxygen saturations).
- In children and young people, no evidence on specific review criteria was identified, therefore the committee agreed by consensus that antibiotic treatment should be stopped

- after 5 days unless the person is not clinically stable, based on clinical judgement.
- The committee could not determine an upper limit on antibiotic course length, as this will be determined in individual circumstances, based on time taken to reach clinical stability.

Antibiotic route of administration

- Intravenous antibiotics switching to oral antibiotics after 2 to 4 days if there was clinical improvement was not significantly different to continuous intravenous antibiotics for mortality, treatment success or recurrence of infection in adults with moderate- to high severity community-acquired pneumonia. However, there were significantly fewer days in hospital and adverse events with the switch to oral antibiotics (1 systematic review, [Athanasia et al. 2008](#)).
- Oral antibiotics (amoxicillin or co-trimoxazole) were not significantly different to intravenous or intermuscular penicillins for clinical failure rate in children and young people (1 month to 18 years) with non-severe community-acquired pneumonia (1 systematic review, [Lodha et al. 2013](#)).
- Oral antibiotics (amoxicillin or co-trimoxazole) were significantly better than intravenous or intramuscular penicillins for mortality (0.05% versus 0.56%), in children and young people (3 months to 18 years) with severe community-acquired pneumonia. However, there were no significant differences in the rates of cure, clinical failure, hospitalisation or relapse, including when oral amoxicillin was analysed separately (Lodha et al. 2013).

Committee discussions on antibiotic route of administration

- The committee discussed evidence on route of administration, which found that oral antibiotics are as effective as injectable antibiotics for children and young people with non-severe community-acquired pneumonia and are more effective for children and young people with severe community-acquired pneumonia.
- Based on the evidence and taking account of the principles of antimicrobial stewardship, the committee agreed that oral antibiotics should be given first line for most children and young people, unless they cannot take oral medicines (for example, if they are vomiting), or the severity of infection means that intravenous antibiotics are required.
- Based on its experience, the principles of antimicrobial stewardship and supported by the evidence in children and young people, the committee agreed that oral antibiotics should also usually be given first line for adults.
- For people with non-severe symptoms or signs, intravenous antibiotics may be required if the person is unable to take oral medicines.
- In line with the [NICE guideline on antimicrobial stewardship](#) and Public Health England's [Start smart – then focus](#), the committee agreed that if intravenous antibiotics are used initially, this should be reviewed by 48 hours (taking into account the person's response to treatment and any microbiological results) and switched to oral treatment where possible.

Other considerations

Medicines adherence

- Medicines adherence may be a problem for some people taking antibiotics that need frequent dosing or longer treatment duration. See the [NICE guideline on medicines adherence](#).

Resource implications

- Recommended antibiotics are all available as generic formulations. See the [Drug Tariff](#) and the [BNF](#) for costs.

See the [evidence review](#) for more information.

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Accreditation

