NICE National Institute for Health and Care Excellence

NICE Pathways

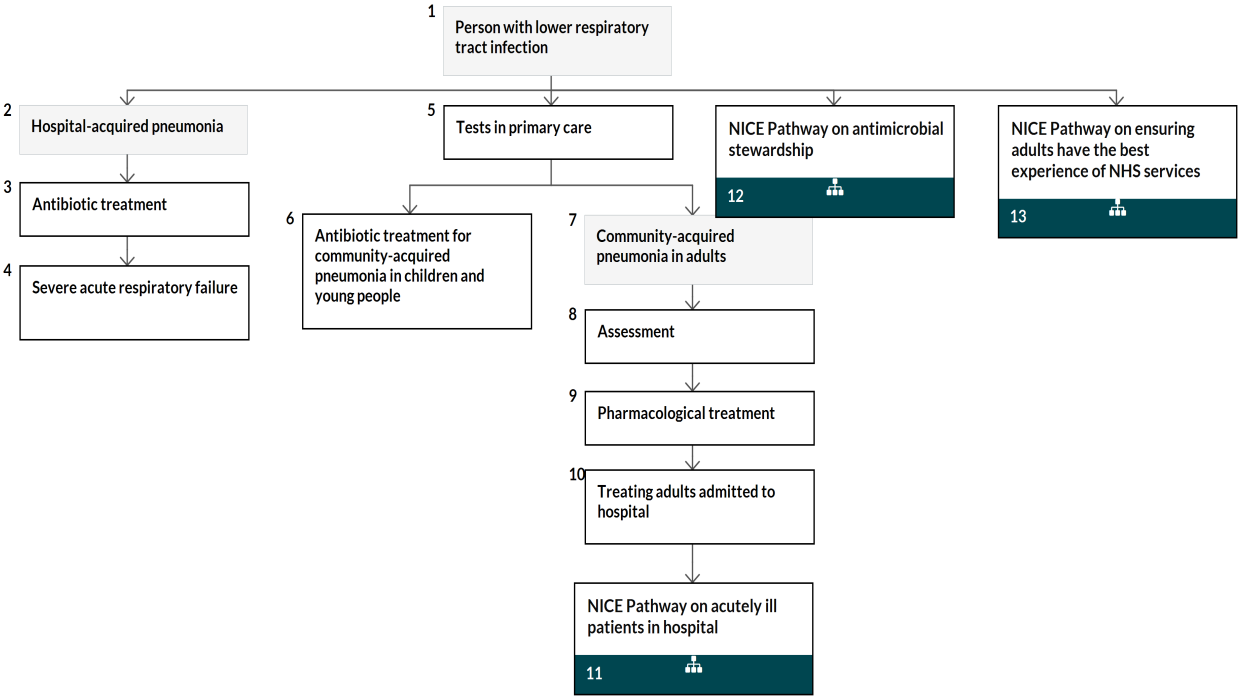
Pneumonia overview

NICE Pathways bring together everything NICE says on a topic in an interactive flowchart. NICE Pathways are interactive and designed to be used online.

They are updated regularly as new NICE guidance is published. To view the latest version of this NICE Pathway see:

http://pathways.nice.org.uk/pathways/pneumonia
NICE Pathway last updated: 27 November 2020

This document contains a single flowchart and uses numbering to link the boxes to the associated recommendations.



1 Person with lower respiratory tract infection

No additional information

2 Hospital-acquired pneumonia

No additional information

3 Antibiotic treatment for hospital-acquired pneumonia

See the NICE COVID-19 rapid guideline on antibiotics for pneumonia in adults in hospital**. Where this guideline covers the existing recommendations below, follow the rapid guideline recommendations during the pandemic**.

For adults, young people and children with symptoms or signs of pneumonia starting within 48 hours of hospital admission, follow the NICE recommendations on community-acquired pneumonia.

Offer an antibiotic(s) for adults, young people and children with hospital-acquired pneumonia. When choosing an antibiotic(s) (see tables on antibiotics for children and young people [See page 12] and antibiotics for adults [See page 19]), take account of:

- the severity of symptoms or signs (at the time of publication [September 2019], no validated severity assessment tools are available for hospital-acquired pneumonia, and severity of symptoms or signs should be based on clinical judgement)
- the number of days in hospital before onset of symptoms
- the risk of developing complications, for example if the person has a relevant comorbidity such as severe lung disease or immunosuppression
- local hospital and ward-based antimicrobial resistance data
- recent antibiotic use
- recent microbiological results, including colonisation with multidrug-resistant bacteria
- recent contact with a health or social care setting before current admission
- the risk of adverse effects with broad-spectrum antibiotics, such as *Clostridium difficile* infection.

Consider following the NICE recommendations on community-acquired pneumonia for choice of antibiotic for adults, young people and children with symptoms or signs of pneumonia starting

within days 3 to 5 of hospital admission who are not at higher risk of resistance.

Start antibiotic treatment as soon as possible after establishing a diagnosis of hospital-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 Pathway on sepsis).

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

If intravenous antibiotics are given, review by 48 hours and consider switching to oral antibiotics if possible.

Send a sample (for example, sputum sample, nasopharyngeal swab or tracheal aspirate) for microbiological testing.

NICE has produced a visual summary on antimicrobial prescribing for hospital-acquired pneumonia.

NICE has published evidence summaries on:

- antimicrobial prescribing: imipenem with cilastatin and relebactam
- antimicrobial prescribing: ceftolozane with tazobactam for treating hospital-acquired pneumonia, including ventilator-associated pneumonia
- antimicrobial prescribing: meropenem with vaborbactam
- antimicrobial prescribing: Ceftazidime/avibactam
- hospital-acquired pneumonia caused by methicillin-resistant Staphylococcus aureus: telavancin.

NICE has published a medtech innovation briefing on FebriDx for C-reactive protein and myxovirus resistance protein A testing.

Reassessment and specialist advice

When microbiological results are available:

- review the choice of antibiotic(s) **and**
- change the antibiotic(s) according to results, using a narrower-spectrum antibiotic, if appropriate.

Reassess adults, young people and children with hospital-acquired pneumonia if symptoms do not improve as expected or worsen rapidly or significantly.

Seek specialist advice from a microbiologist for adults, young people and children with hospital-acquired pneumonia if they have:

- symptoms that are not improving as expected with antibiotics **or**
- multidrug-resistant bacteria.

Follow the NICE Pathway on caring for an adult at the end of life when caring for adults with hospital-acquired pneumonia who are approaching their end of life.

See the NICE Pathways on acutely ill patients in hospital and prevention and control of healthcare-associated infections.

Rationale

See the NICE guideline to find out why we made these recommendations.

4 Severe acute respiratory failure

NICE has published interventional procedures guidance on the following procedures with **special arrangements** for consent, audit and clinical governance:

- extracorporeal membrane carbon dioxide removal for acute respiratory failure
- extracorporeal membrane oxygenation for severe acute respiratory failure in adults.

5 Tests in primary care

NICE has published medtech innovation briefings on:

- FebriDx for C-reactive protein and myxovirus resistance protein A testing
- Alere Afinion CRP for C-reactive protein testing in primary care
- QuikRead go for C-reactive protein testing in primary care.

See the NICE Pathway on self-limiting respiratory tract and ear infections – antibiotic prescribing.

6 Antibiotic treatment for community-acquired pneumonia in children and young people

Please note that the recommendations below apply to children and young people aged 72 hours and over.

Offer an antibiotic(s) for children and young people with community-acquired pneumonia. When choosing an antibiotic (see the table on antibiotics for children and young people [See page 15]), take account of:

- the severity of symptoms or signs for children and young people, based on clinical judgement (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)
- the risk of developing complications, for example if the person has a 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.

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 Pathway on sepsis).

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

If intravenous antibiotics are given, review by 48 hours and consider switching to oral antibiotics if possible.

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.

NICE has produced a visual summary on antimicrobial prescribing for community-acquired pneumonia.

Advice

Give advice to young people and children with community-acquired pneumonia about:

- possible adverse effects of the antibiotic(s)
- how long symptoms are likely to last
- 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.

NICE has written information for the public on antimicrobial prescribing for community-acquired pneumonia.

Reassessment

Reassess young people and children with community-acquired pneumonia if symptoms or signs do not improve as expected or worsen rapidly or significantly.

When reassessing young people and children with community-acquired pneumonia, be aware of possible non-bacterial causes, such as flu.

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.

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

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

Rationale

See the NICE guideline to find out why we made these recommendations.

7 Community-acquired pneumonia in adults

No additional information

8 Assessment for community-acquired pneumonia

Follow the NICE COVID-19 rapid guidelines on managing suspected or confirmed pneumonia in adults in the community **for assessment in primary care, and** antibiotics for pneumonia in adults in hospital **for assessment in hospital.**

Microbiological tests

Rapidly identifying bloodstream bacteria and fungi

The following recommendation is from NICE diagnostics guidance on SepsiTest assay for rapidly identifying bloodstream bacteria and fungi.

There is currently insufficient evidence to recommend the routine adoption in the NHS of the SepsiTest assay for rapidly identifying bloodstream bacteria and fungi. The tests show promise and further research to provide robust evidence is encouraged, particularly to demonstrate the value of using the test results in clinical decision making (see sections 5.18 to 5.22 of NICE diagnostics guidance 20).

NICE has published a medtech innovation briefing on Fungitell for antifungal treatment stratification.

Diagnosing and monitoring sepsis

The following recommendation is from NICE diagnostics guidance on procalcitonin testing for diagnosing and monitoring sepsis.

The procalcitonin tests (ADVIA Centaur BRAHMS PCT assay, BRAHMS PCT Sensitive Kryptor assay, Elecsys BRAHMS PCT assay, LIAISON BRAHMS PCT assay or VIDAS BRAHMS PCT assay) show promise but there is currently insufficient evidence to recommend their routine adoption in the NHS. Further research on procalcitonin tests is recommended for guiding decisions to:

- stop antibiotic treatment in people with confirmed or highly suspected sepsis in the intensive care unit or

- start and stop antibiotic treatment in people with suspected bacterial infection presenting to the emergency department.

Centres currently using procalcitonin tests to guide these decisions are encouraged to participate in research and data collection (see section 6.25 of NICE diagnostics guidance 18).

See the NICE Pathway on sepsis.

9 Pharmacological treatment for community-acquired pneumonia

See the NICE COVID-19 rapid guideline on managing suspected or confirmed pneumonia in adults in the community**. Where this guideline covers the existing recommendations below, follow the rapid guideline recommendations during the pandemic.**

Antibiotic treatment

Offer an antibiotic(s) for adults with community-acquired pneumonia. When choosing an antibiotic (see the table on antibiotics for adults [See page 22]) take account of:

- the severity assessment for adults
- the risk of developing complications, for example if the person has comorbidity such as severe lung disease or immunosuppression
- local antimicrobial resistance and surveillance data (such as flu and mycoplasma infection rates)
- recent antibiotic use
- recent microbiological results, including colonisation with multidrug-resistant bacteria.

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 Pathway on sepsis).

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

If intravenous antibiotics are given, review by 48 hours and consider switching to oral antibiotics if possible.

NICE has produced a visual summary on antimicrobial prescribing for community-acquired pneumonia.

Advice

Give advice to adults with community-acquired pneumonia about:

- possible adverse effects of the antibiotic(s)
- how long symptoms are likely to last
- 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.

NICE has written information for the public on antimicrobial prescribing for community-acquired pneumonia.

Reassessment

Reassess adults with community-acquired pneumonia if symptoms or signs do not improve as expected or worsen rapidly or significantly.

When reassessing adults with community-acquired pneumonia, be aware of possible non-bacterial causes, such as flu.

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.

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

Refer adults with community-acquired pneumonia to hospital 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.

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).

Rationale

See the NICE guideline to find out why we made these recommendations.

10 Treating adults admitted to hospital

Follow the NICE COVID-19 rapid guideline on antibiotics for pneumonia in adults in hospital**.**

Severe acute respiratory failure

NICE has published interventional procedures guidance on the following procedures with **special arrangements** for consent, audit and clinical governance:

- extracorporeal membrane carbon dioxide removal for acute respiratory failure
- extracorporeal membrane oxygenation for severe acute respiratory failure in adults.

Safe discharge from hospital

See discharge vulnerable people from health or social care settings to a warm home in the NICE Pathway on excess winter deaths and illnesses associated with cold homes.

11 NICE Pathway on acutely ill patients in hospital

See Acutely ill patients in hospital

12 NICE Pathway on antimicrobial stewardship

See Antimicrobial stewardship

13 NICE Pathway on ensuring adults have the best experience of NHS services

See Patient experience in adult NHS services

Antibiotics for children and young people under 18 years with hospital-acquired pneumonia

Antibiotic	Dosage and course length
Choice for children under 1 month	
Antibiotic choice based on local resistance data and specialist microbiological advice	
First choice oral antibiotic for children aged 1 month and over if non-severe symptoms or signs and not at higher risk of resistance (guided by microbiological results when available)	
Co-amoxiclav	1 month to 11 months, 0.5 ml/kg of 125/31 suspension three times a day for 5 days, then review 1 year to 5 years, 10 ml of 125/31 suspension (or 5 ml of 250/62 suspension) three times a day, or 0.5 ml/kg of 125/31 suspension three times a day for 5 days, then review 6 years to 11 years, 10 ml of 250/62 suspension three times a day or 0.3 ml/kg of 250/62 suspension three times a day for 5 days, then review 12 years to 17 years, 500/125 mg three times a day for 5 days, then review
Alternative oral antibiotics for children aged 1 month and over if non-severe symptoms or signs and not at higher risk of resistance, for penicillin allergy or if co-amoxiclav unsuitable (other options may be suitable based on specialist microbiological advice and local resistance data)	
Clarithromycin	1 month to 11 years:

	Under 8 kg, 7.5 mg/kg twice a day for 5 days, then review 8 kg to 11 kg, 62.5 mg twice a day for 5 days, then review 12 kg to 19 kg, 125 mg twice a day for 5 days, then review 20 kg to 29 kg, 187.5 mg twice a day for 5 days, then review 30 kg to 40 kg, 250 mg twice a day for 5 days, then review 12 years to 17 years, 500 mg twice a day for 5 days, then review
First-choice intravenous antibiotics if severe symptoms or signs (for example, symptoms or signs of sepsis), or at higher risk of resistance (antibiotic choice should be based on specialist microbiological advice and local resistance data)	
Options include:	
Piperacillin with tazobactam	1 month to 11 years, 90 mg/kg three or four times a day (maximum 4.5 g per dose four times a day) 12 years to 17 years, 4.5 g 3 times a day (increased to 4.5 g four times a day if severe infection)
Ceftazidime	1 month to 17 years, 25 mg/kg three times a day (50 mg/kg three times a day if severe infection; maximum 6 g per day)
Ceftriaxone	1 month to 11 years (up to 50 kg), 50 mg/kg to 80 mg/kg once a day (use dose at higher end of range if severe infection; maximum 4 g per day) 9 years to 11 years (50 kg and above), 2 g once a day 12 years to 17 years, 2 g once a day

Antibiotics to be added if suspected or confirmed MRSA **infection** (dual therapy with a first-choice IV antibiotic)	
Teicoplanin	1 month, initially 16 mg/kg for 1 dose, then 8 mg/kg once daily, subsequent dose to be given 24 hours after initial dose (doses given by IV infusion) 2 months to 11 years, initially 10 mg/kg every 12 hours intravenously for 3 doses, then 6 mg/kg to 10 mg/kg once daily intravenously 12 years to 17 years, initially 6 mg/kg every 12 hours intravenously for 3 doses, then 6 mg/kg once daily intravenously (see BNF for children for information on monitoring)
Vancomycin	1 month to 11 years, 10 mg/kg to 15 mg/kg four times a day intravenously, adjusted according to serum-vancomycin concentration 12 years to 17 years, 15 mg/kg to 20 mg/kg two or three times a day intravenously, adjusted according to serum-vancomycin concentration (a loading dose of 25 mg/kg to 30 mg/kg can be used in seriously ill people); maximum 2 g per dose
Linezolid (if vancomycin cannot be used; off-label use; specialist advice only)	3 months to 11 years, 10 mg/kg three times a day orally or intravenously (maximum 600 mg per dose) 12 years to 17 years, 600 mg twice a day orally or intravenously (see BNF for children for information on monitoring)
See the 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. 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.

Higher risk of resistance includes symptoms or signs starting more than 5 days after hospital admission, relevant comorbidity such as severe lung disease or immunosuppression, recent use of broad-spectrum antibiotics, colonisation with multidrug-resistant bacteria, and recent contact with a health or social care setting before current admission.

Review treatment after a total of 5 days of antibiotics and consider stopping antibiotics if clinically stable. Review intravenous antibiotics by 48 hours and consider switching to oral antibiotics for a total of 5 days, then review.

For off-label use, the prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's good practice in prescribing and managing medicines and devices for further information.

Antibiotics for children and young people under 18 years with community-acquired pneumonia

Antibiotic	Dosage and course length
Children under 1 month	
Refer to paediatric specialist.	
First-choice oral antibiotic for children aged 1 month and over if non-severe symptoms or signs (based on clinical judgement)	
Amoxicillin	1 to 11 months, 125 mg three times a day for 5 days 1 to 4 years, 250 mg three times a day for 5 days 5 to 17 years, 500 mg three times a day for 5 days (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 suspected)	
Clarithromycin	1 month to 11 years: Under 8 kg, 7.5 mg/kg twice a day for 5 days 8 to 11 kg, 62.5 mg twice a day for 5 days 12 to 19 kg, 125 mg twice a day for 5 days 20 to 29 kg, 187.5 mg twice a day for 5 days 30 to 40 kg, 250 mg twice a day for 5 days 12 to 17 years: 250 mg to 500 mg twice a day for 5 days
Erythromycin (in pregnancy)	8 to 17 years, 250 mg to 500 mg four times a day for 5 days
Doxycycline	12 to 17 years, 200 mg on first day, then 100 mg once a day for 4 days (5-day course in total) (see BNF for children for use of doxycycline in children under 12)
First-choice antibiotic(s) if severe symptoms or signs (based on clinical judgement; guided by microbiological results when available)	
Co-amoxiclav	Oral doses:

	1 to 11 months, 0.5 ml/kg of 125/31 suspension three times a day for 5 days 1 to 5 years, 10 ml of 125/31 suspension three times a day or 0.5 ml/kg of 125/31 suspension three times a day for 5 days (or 5 ml of 250/62 suspension) 6 years to 11 years, 10 ml of 250/62 suspension three times a day or 0.3 ml/kg of 250/62 suspension three times a day for 5 days 12 to 17 years, 500/125 mg three times a day for 5 days IV doses: 1 month to 2 months, 30 mg/kg twice a day 3 months to 17 years, 30 mg/kg three times a day (maximum 1.2 g per dose three times a day)
With (if atypical pathogen suspected):	
Clarithromycin **or**	Oral doses: 1 month to 11 years: Under 8 kg, 7.5 mg/kg twice a day for 5 days 8 kg to 11 kg, 62.5 mg twice a day for 5 days 12 kg to 19 kg, 125 mg twice a day for 5 days 20 kg to 29 kg, 187.5 mg twice a day for 5 days 30 kg to 40 kg, 250 mg twice a day for 5 days 12 years to 17 years: 250 mg to 500 mg twice a day for 5 days

	IV doses: 1 month to 11 years, 7.5 mg/kg twice a day (maximum 500 mg per dose) 12 to 17 years, 500 mg twice a day
Erythromycin (in pregnancy)	8 years to 17 years, 250 mg to 500 mg four times a day orally for 5 days
Alternative antibiotics if severe symptoms or signs (based on clinical judgement), **for penicillin allergy** (guided by microbiological results when available)	
Consult local microbiologist	
See the 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. 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. Give oral antibiotics first line if the person can take oral medicines, and the severity of their condition does not require intravenous antibiotics. Review intravenous antibiotics by 48 hours and consider switching to oral antibiotics if possible. Stop antibiotic treatment after 5 days unless microbiological results suggest a longer course length 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 less than 90 mmHg, heart rate more than 100/minute, respiratory rate less than 24/minute, arterial oxygen saturation less than 90% or PaO2 under 60 mmHg in room air]).	

Mycoplasma pneumoniae infection occurs in outbreaks approximately every 4 years and is more common in school-aged children.

Antibiotics for adults aged 18 years and over with hospital-acquired pneumonia

Antibiotic	Dosage and course length
First-choice oral antibiotic if non-severe symptoms or signs, and not at higher risk of resistance (guided by microbiological results when available)	
Co-amoxiclav	500/125 mg three times a day for 5 days then review
Alternative oral antibiotics if non-severe symptoms or signs, and not at higher risk of resistance, for penicillin allergy or if co-amoxiclav unsuitable (based on specialist microbiological advice and local resistance data)	
Options include:	
Doxycycline	200 mg on first day, then 100 mg once a day for 4 days (5-day course) then review
Cefalexin (caution in penicillin allergy)	500 mg twice or three times a day (can be increased to 1 g to 1.5 g three or four times a day) for 5 days then review
Co-trimoxazole (off-label use)	960 mg twice a day for 5 days then review (see BNF for information on monitoring)
Levofloxacin (only if switching from IV levofloxacin with specialist	500 mg once or twice a day for 5 days then review

advice; off-label use; consider safety issues)	
First-choice intravenous antibiotics if severe symptoms or signs (for example, symptoms or signs of sepsis) or at higher risk of resistance (based on specialist microbiological advice and local resistance data)	
Options include:	
Piperacillin with tazobactam	4.5 g three times a day (increased to 4.5 g four times a day if severe infection)
Ceftazidime	2 g three times a day
Ceftriaxone	2 g once a day
Cefuroxime	750 mg three times a day (increased to 750 mg four times a day or 1.5 g three or four times a day if severe infection)
Meropenem	0.5 g to 1 g three times a day
Ceftazidime with avibactam	2/0.5 g three times a day
Levofloxacin (off-label use; consider safety issues)	500 mg once or twice a day (use higher dosage if severe infection)
Antibiotics to be added if suspected or confirmed MRSA **infection (dual therapy with a first-choice IV antibiotic)**	
Vancomycin	15 mg/kg to 20 mg/kg two or three times a day intravenously,

	adjusted according to serum-vancomycin concentration (a loading dose of 25 mg/kg to 30 mg/kg can be used in seriously ill people); maximum 2 g per dose (see BNF for information on monitoring)
Teicoplanin	Initially 6 mg/kg every 12 hours for 3 doses, then 6 mg/kg once a day intravenously (see BNF for information on monitoring)
Linezolid (if vancomycin cannot be used; specialist advice only)	600 mg twice a day orally or intravenously

See the 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.

Higher risk of resistance includes symptoms or signs starting more than 5 days after hospital admission, relevant comorbidity such as severe lung disease or immunosuppression, recent use of broad-spectrum antibiotics, colonisation with multidrug-resistant bacteria, and recent contact with a health or social care setting before current admission.

Review treatment after a total of 5 days of antibiotics and consider stopping antibiotics if clinically stable. Review intravenous antibiotics by 48 hours and consider switching to oral antibiotics for a total of 5 days, then review.

For off-label use, the prescriber should follow relevant professional guidance, taking full responsibility for the decision. Informed consent should be obtained and documented. See the General Medical Council's good practice in prescribing and managing medicines and devices for further information.

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).

Antibiotics for adults aged 18 years and over with community-acquired pneumonia

Antibiotic	Dosage and course length
First-choice oral antibiotic if low severity (based on clinical judgement and guided by CRB65 score 0, or CURB65 score 0 or 1)	
Amoxicillin	500 mg three times a day (higher doses can be used; see the BNF) for 5 days
Alternative oral antibiotics if low severity, for penicillin allergy or if amoxicillin unsuitable (for example, atypical pathogens suspected)	
Doxycycline	200 mg on first day, then 100 mg once a day for 4 days (5-day course in total)
Clarithromycin	500 mg twice a day for 5 days
Erythromycin (in pregnancy)	500 mg four times a day for 5 days
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 available)	
Amoxicillin	500 mg three times a day (higher doses can be used; see the BNF) for 5 days
With (if atypical pathogen	

suspected)	
Clarithromycin **or**	500 mg twice a day for 5 days
Erythromycin (in pregnancy)	500 mg four times a day for 5 days
Alternative oral antibiotics if moderate severity, for penicillin allergy (guided by microbiological results when available)	
Doxycycline	200 mg on first day, then 100 mg once a day for 4 days (5-day course in total)
Clarithromycin	500 mg twice a day for 5 days
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 available)	
Co-amoxiclav **with**:	500/125 mg three times a day orally or 1.2 g three times a day intravenously for 5 days
Clarithromycin **or**	500 mg twice a day orally or intravenously for 5 days
Erythromycin (in pregnancy)	500 mg four times a day orally for 5 days
Alternative antibiotic if high severity, for penicillin allergy (guided by microbiological results when available; consult a local microbiologist if fluoroquinolone not appropriate)	
Levofloxacin (consider safety issues)	500 mg twice a day orally or intravenously for 5 days

See the 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.

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

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

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

For fluoroquinolone antibiotics, see Medicines and Healthcare products Regulatory Agency (MHRA) advice for restrictions and precautions 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).

Consider adding a macrolide to amoxicillin if atypical pathogens are suspected, and review when microbiological results are available. *Mycoplasma pneumoniae* infection occurs in outbreaks approximately every 4 years.

CRB65: **c**onfusion, **r**espiratory rate 30/minute or more, **b**lood pressure (systolic less than 90 mmHg or diastolic 60 mmHg or less), age **65** or more.

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: **c**onfusion, **r**espiratory rate 30/minute or more, low systolic [less than 90 mmHg] or diastolic [60 mmHg or less] **b**lood pressure, age **65** or more). 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: **c**onfusion, urea more than 7 mmol/litre, respiratory rate 30/minute or more, blood pressure (systolic less than 90 mmHg or diastolic 60 mmHg or less), age **65** or more.

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: (**c**onfusion, **u**rea more than 7 mmol/litre, **r**espiratory rate 30/minute or more, low systolic [less than 90 mmHg] or diastolic [60 mmHg or less] **b**lood pressure, age **65 or more**). 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).

Glossary

Community-acquired pneumonia

(pneumonia that is acquired outside hospital: pneumonia that develops in a nursing home resident is included in this definition; when managed in hospital the diagnosis is usually confirmed by chest X-ray)

Higher risk of resistance

(includes symptoms or signs of pneumonia starting more than 5 days after hospital admission, relevant comorbidity such as severe lung disease or immunosuppression, recent use of broad-spectrum antibiotics, colonisation with multidrug-resistant bacteria, and recent contact with health and social care settings before current admission)

Hospital-acquired pneumonia

(pneumonia that develops 48 hours or more after hospital admission and that was not

incubating at hospital admission: when managed in hospital, the diagnosis is usually confirmed by chest X-ray; for the purpose of this guidance, pneumonia that develops in hospital after intubation (ventilator-associated pneumonia) is excluded from this definition)

severe symptoms or signs

(includes 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)

Sources

Pneumonia (hospital-acquired): antimicrobial prescribing (2019 updated 2020) NICE guideline NG139

Pneumonia (community-acquired): antimicrobial prescribing (2019) NICE guideline NG138

SepsiTest assay for rapidly identifying bloodstream bacteria and fungi (2016, updated 2020) NICE diagnostics guidance 20

Procalcitonin testing for diagnosing and monitoring sepsis (ADVIA Centaur BRAHMS PCT assay, BRAHMS PCT Sensitive Kryptor assay, Elecsys BRAHMS PCT assay, LIAISON BRAHMS PCT assay and VIDAS BRAHMS PCT assay) (2015) NICE diagnostics guidance 18

Your responsibility

Guidelines

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.

Technology appraisals

The recommendations in this interactive flowchart represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, health professionals are expected to take these recommendations fully into account, alongside the individual needs, preferences and values of their patients. The application of the recommendations in this interactive flowchart is at the discretion of health professionals and their individual patients and do not override the responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or their carer or guardian.

Commissioners and/or providers have a responsibility to provide the funding required to enable the recommendations to be applied when individual health professionals and their patients wish to use it, in accordance with the NHS Constitution. They should do so 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.

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.

Medical technologies guidance, diagnostics guidance and interventional procedures guidance

The recommendations in this interactive flowchart represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, healthcare

professionals are expected to take these recommendations fully into account. However, the interactive flowchart does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

Commissioners and/or providers have a responsibility to implement the recommendations, in their local context, in light of their duties to have due regard to the need to eliminate unlawful discrimination, advance equality of opportunity, and foster good relations. Nothing in this interactive flowchart should be interpreted in a way that would be inconsistent with compliance 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.