Pneumonia (hospital-acquired): antimicrobial prescribing

NICE National Institute for Health and Care Excellence

Pneumonia (hospital-acquired)

- Offer an antibiotic(s) within 4 hours of establishing a diagnosis
- Send a respiratory sample (sputum sample, nasopharyngeal swab or tracheal aspirate) for microbiological testing

When microbiological results available:

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

Reassess if symptoms:

- **do not improve as expected, or**
- **worsen rapidly or significantly**

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Seek specialist advice from a microbiologist for:

- symptoms that are not improving as expected with antibiotics, or
- multi-drug resistant bacteria

Follow the NICE guideline on care of dying adults in the last days of life for adults approaching the end of life

Background

Hospital-acquired pneumonia:

- **develops 48 hours or more after hospital admission and was not incubating at the time of admission**
- **does not include pneumonia developing after intubation (ventilator-associated), in this guideline**

Prescribing considerations

When choosing an antibiotic(s), take account of:

- **severity of symptoms and signs (based on clinical judgement*)**
- **number of days in hospital before onset of symptoms**
- **the risk of developing complications, for example if the person has a 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 multi-drug resistant bacteria**
- **recent healthcare exposure before current admission**
- **the risk of adverse effects with broad spectrum antibiotics**

Give oral antibiotics first line if possible

Review intravenous antibiotics by 48 hours and consider stepping down to oral antibiotics if possible

***No validated severity assessment tools were available for hospital-acquired pneumonia at the the time of publication**

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Choice of antibiotic: adults aged 18 years and over

Antibiotic[1]	Dosage and course length[2]
First choice antibiotic if non-severe symptoms or signs and not at higher risk of resistance (guided by microbiological results when available)[3,4]	
Co-amoxiclav	500/125 mg three times a day orally or 1.2 g three times a day IV[5] for 5 days in total then review[6]
Alternative if non-severe symptoms or signs and not at higher risk of resistance, for penicillin allergy or co-amoxiclav unsuitable (guided by microbiological results when available)[3,4]	
Levofloxacin[7]	500 mg once or twice a day orally or IV[5] for 5 days in total then review[6]
First choice antibiotics (given IV for at least 48 hours) if severe symptoms or signs (for example, symptoms or signs of sepsis) or at higher risk of resistance (guided by microbiological results when available)[4,5]	
Piperacillin with tazobactam	4.5 g three times a day (increased to 4.5 g four times a day if severe infection)
Levofloxacin[7]	500 mg once or twice a day (use higher dosage if severe infection)
Ceftazidime	2 g three times a day
Ceftriaxone	2 g once a day
Cefuroxime	750 mg three or four times a day (increased to 1.5 g three or four times a day if severe infection)
Meropenem (specialist advice only)	0.5 to 1 g three times a day
Ceftazidime with avibactam (specialist advice only)	2/0.5 g three times a day
Intravenous antibiotics to be added if suspected or confirmed MRSA infection (dual therapy with an IV antibiotic listed above)[5]	
Vancomycin	15 to 20 mg/kg two or three times a day (maximum 2 g per dose), adjusted according to serum-vancomycin concentration[8]
Linezolid (if vancomycin cannot be used; specialist advice only)	600 mg twice a day
Oral antibiotics (when IV antibiotics no longer required[5]; guided by microbiological results when available)	
Co-amoxiclav	500/125 mg three times a day for 5 days in total (including IV antibiotics) then review[6]
Levofloxacin	500 mg once or twice a day for 5 days in total (including IV antibiotics) then review[6]
Cefuroxime	500 mg twice a day for 5 days in total (including IV antibiotics) then review[6]

[1]See BNF and MHRA advice for use in specific populations, for example, hepatic impairment, renal impairment, pregnancy and breast-feeding, and administering IV antibiotics.
[2]Oral doses are for immediate-release medicines.
[3]Give oral antibiotics first-line if the person can take oral medicines.
[4]Higher risk of resistance includes onset of symptoms more than 5 days after hospital admission, relevant comorbidity (such as severe lung disease or immunosuppression), recent (within last 3 months) antibiotic use, colonisation with multi-drug resistant bacteria and recent healthcare exposure before current admission.
[5]Review IV antibiotics by 48 hours and consider stepping down to oral antibiotics if possible.
[6]Review treatment after 5 days and consider stopping the antibiotic if the person is clinically stable.
[7]Use of levofloxacin for hospital-acquired pneumonia is off-label. Prescribers should follow GMC guidance on off-label prescribing.
[8]Therapeutic drug monitoring and assessment of renal function is required. A loading dose of 25 to 30 mg/kg (maximum per dose 2 g) can be used in seriously unwell people to facilitate rapid attainment of the target trough serum vancomycin concentration (BNF, November 2018).
Abbreviations: IV, Intravenous; MRSA, methicillin-resistant *Staphylococcus aureus*

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Choice of antibiotic: children and young people under 18 years

Antibiotic[1]	Dosage and course length[2]
First choice antibiotic if non-severe symptoms or signs and not at higher risk of resistance (guided by microbiological results when available)[3,4]	
Co-amoxiclav	Oral doses 3 to 11 months, 0.5 ml/kg of 125/31 suspension three times a day for 5 days then review[5] 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 then review[5] 6 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[5] 12 to 17 years, 500/125 mg three times a day for 5 days then review[5] IV dose - 3 months to 17 years, 30 mg/kg three times a day (maximum 1.2 g per dose)[6]
Alternative if non-severe symptoms or signs and not at higher risk of resistance, for penicillin allergy or if co-amoxiclav unsuitable (guided by microbiological results when available)[3,4]	
Clarithromycin	Oral doses: 3 months to 11 years: Under 8 kg, 7.5 mg/kg twice a day for 5 days then review[5]; 8 to 11 kg, 62.5 mg twice a day for 5 days then review[5] 12 to 19 kg, 125 mg twice a day for 5 days then review[5]; 20 to 29 kg, 187.5 mg twice a day for 5 days then review[5] 30 to 40 kg, 250 mg twice a day for 5 days then review[5] IV dose: 3 months to 11 years 7.5 mg/kg twice a day (maximum 500 mg per dose) 12 to 17 years, 500 mg twice a day orally or IV[6] for 5 days in total then review[5]
First choice antibiotics (given IV for at least 48 hours) if severe symptoms or signs or at higher risk of resistance (guided by microbiological results when available)[4,6]	
Piperacillin with tazobactam	3 months to 11 years, 90 mg/kg three or four times a day (maximum 4.5 g per dose four times a day) 12 to 17 years, 4.5 g three times a day (increased to 4.5 g four times a day if severe infection)
Ceftazidime	3 months 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	3 months to 11 years (up to 50 kg), 50 to 80 mg/kg once a day (use dose at higher end of range if severe infection; maximum 4 g per day) 9 to 11 years (50 kg and above), 2 g once a day 12 to 17 years, 2 g once a day
Cefuroxime	3 months to 17 years, 20 mg/kg three times a day (maximum 750 mg per dose), increased to 50 to 60 mg/kg three or four times a day if severe infection (maximum 1.5 g per dose)
IV antibiotics to be added if suspected or confirmed MRSA infection (dual therapy with an intravenous antibiotic listed above)[6]	
Vancomycin	3 months to 11 years, 10 to 15 mg/kg four times a day, adjusted according to serum-vancomycin concentration[7] 12 to 17 years, 15 to 20 mg/kg two or three times a day (maximum 2 g per dose), adjusted according to serum-vancomycin concentration[7]
Linezolid[8] (if vancomycin cannot be used; specialist advice)	3 months to 11 years, 10 mg/kg three times a day 12 to 17 years, 600 mg twice a day
Oral antibiotics (when IV antibiotics no longer required[6]; guided by microbiological results when available)	
Co-amoxiclav or clarithromycin	See oral doses above; for 5 days in total (including IV antibiotics) then review[5]
Cefuroxime	3 months to 1 year, 10 mg/kg twice a day (maximum 125 mg per dose) for 5 days in total (including IV antibiotics) then review[5] 2 to 11 years, 15 mg/kg twice a day (maximum 250 mg per dose) for 5 days in total (including IV antibiotics) then review[5] 12 to 17 years, 500 mg twice daily for 5 days in total (including IV antibiotics) then review[5]

See table for adults for footnotes 1 to 4 and abbreviations. [5]Review treatment after 5 days and consider stopping the antibiotic if the person is clinically stable.
[6]Review intravenous antibiotics by 48 hours and consider stepping down to oral antibiotics where possible.
[7]Therapeutic drug monitoring and assessment of renal function is required; see summary of product characteristics (BNF, November 2018).
[8]Use of linezolid for children and young people is off-label. Prescribers should follow GMC guidance on off-label prescribing.