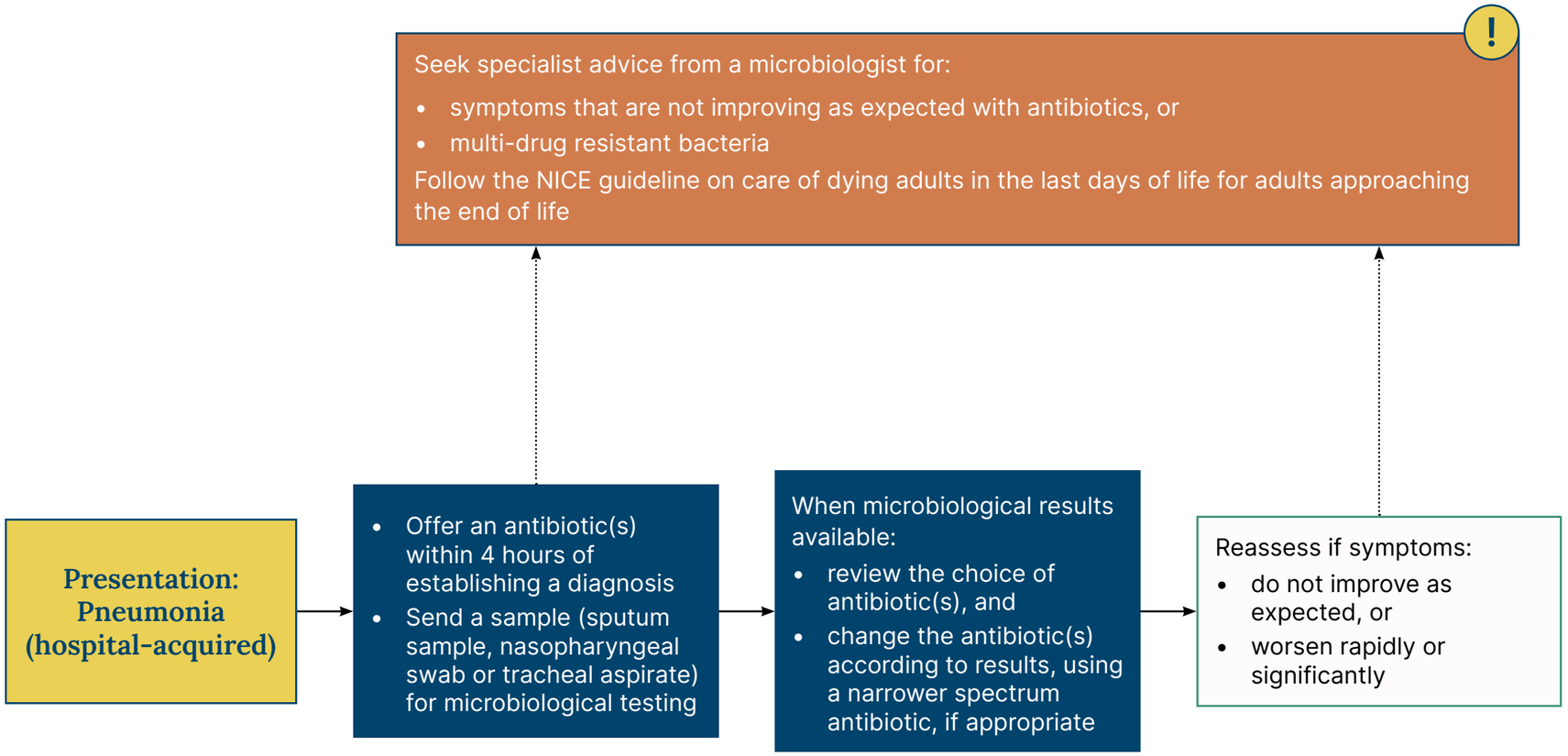
Pneumonia (hospital-acquired): antimicrobial prescribing



Background

Hospital-acquired pneumonia develops 48 hours or more after hospital admission

In this guideline, hospital-acquired pneumonia does not include pneumonia developing after intubation (ventilator-associated)

Follow the NICE guideline on community-acquired pneumonia if symptoms start within 48 hours of admission

Prescribing considerations

Consider following the NICE guideline on community-acquired pneumonia for choice of antibiotic if symptoms start within 3 to 5 days of admission and not at higher risk of resistance

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

- severity of symptoms and signs (based on clinical judgement; no validated severity assessment tools were available for hospital-acquired pneumonia at the the time of publication)
- 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 multi-drug resistant bacteria
- recent contact with health or social care setting before current admission
- the risk of adverse effects with broad spectrum antibiotics, including Clostridium difficile infection

Give oral antibiotics first line if possible

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

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Choice of antibiotic: adults aged 18 years and over	
Antibiotic	**Dosage and course length**
First-choice oral antibiotic for 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 for non-severe symptoms or signs and not at higher risk of resistance, if penicillin allergy or if co-amoxiclav unsuitable. Base choice 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 to 1.5 g three or four times a day) for 5 days then review
Co-trimoxazole	960 mg twice a day for 5 days then review
Levofloxacin (only if switching from intravenous levofloxacin with specialist advice) !	500 mg once or twice a day for 5 days then review
First-choice intravenous antibiotics if severe symptoms or signs (for example, of sepsis) or at higher risk of resistance. Base choice 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 to 1 g three times a day
Ceftazidime with avibactam	2/0.5 g three times a day
Levofloxacin (only if other first-choice antibiotics are unsuitable) !	500 mg once or twice a day (use higher dosage if severe infection)

Choice of antibiotic: adults aged 18 years and over, continued	
Antibiotic	**Dosage and course length**
Antibiotics to be added if suspected or confirmed MRSA infection (dual therapy with an intravenous antibiotic)	
Vancomycin	15 to 20 mg/kg two or three times a day intravenously, adjusted according to serum vancomycin; loading dose of 25 to 30 mg/kg for serious illness (maximum 2 g per dose)
Teicoplanin	Initially 6 mg/kg every 12 hours for 3 doses, then 6 mg/kg once a day
Linezolid (if vancomycin cannot be used; specialist advice only)	600 mg twice a day orally or intravenously

Notes

For **all antibiotics**: see BNF for appropriate use and dosing in specific populations, for example, hepatic impairment, renal impairment, pregnancy and breast-feeding, and administering intravenous (or, where appropriate, intramuscular) antibiotics. Oral doses are for immediate-release medicines.

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 multi-drug resistant bacteria and recent contact with health or social care setting before current admission.

For **first- and alternative-choice oral antibiotics:** review treatment after a total of 5 days of antibiotics and consider stopping the antibiotic if clinically stable.

For **intravenous antibiotics**: review by 48 hours and consider switching to oral antibiotics for a total of 5 days and then review.

For **co-trimoxazole:** see BNF for information on monitoring of patient parameters and therapeutic drug monitoring. In September 2024, this was an off-label use (see NICE's information on prescribing medicines).

For **vancomycin, teicoplanin and linezolid:** see BNF for information on monitoring of patient parameters and therapeutic drug monitoring.

! **Warning:** for **levofloxacin,** see the MHRA January 2024 advice on restrictions and precautions for using fluoroquinolone antibiotics because of the risk of disabling and potentially long-lasting or irreversible side effects. Fluoroquinolones must now only be prescribed when other commonly recommended antibiotics are inappropriate. In september 2024 levofloxacin for hospital-acquired pneumonia was an off-label use. See NICE's information on prescribing medicines

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Choice of antibiotic: children and young people under 18 years

Antibiotic	Dosage and course length
Children under 1 month: antibiotic choice based on local resistance data and specialist microbiological advice	
Children 1 month and over: 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	1 to 11 months, 0.5 ml/kg of 125/31 suspension three times a day for 5 days then review 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 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 12 to 17 years, 500/125 mg three times a day for 5 days then review (or 5 ml of 250/62 suspension)
Children 1 month and over: alternative oral antibiotic 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 to 11 kg, 62.5 mg twice a day for 5 days then review; 12 to 19 kg, 125 mg twice a day for 5 days then review; 20 to 29 kg, 187.5 mg twice a day for 5 days then review; 30 to 40 kg, 250 mg twice a day for 5 days then review 12 to 17 years, 500 mg twice a day for 5 days then review
Children 1 month and over: first-choice intravenous antibiotics if severe symptoms or signs (for example, symptoms or signs of sepsis) or at higher risk of resistance. Antibiotic choice based on specialist microbiological advice only 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 to 17 years, 4.5 g three 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 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
Children 1 month and over: antibiotics to be added if suspected or confirmed MRSA infection (dual therapy with an intravenous antibiotic)	
Teicoplanin	1 month, initially 16 mg/kg for 1 dose, then 8 mg/kg once daily, subsequent dose given 24 hours after initial dose (doses given by intravenous infusion) 2 months to 11 years, initially 10 mg/kg every 12 hours intravenously for 3 doses, then 6 to 10 mg/kg once daily intravenously 12 to 17 years, initially 6 mg/kg every 12 hours intravenously for 3 doses, then 6 mg/kg once daily intravenously
Vancomycin	1 months to 11 years, 10 to 15 mg/kg four times a day, adjusted according to serum vancomycin 12 to 17 years, 15 to 20 mg/kg two or three times a day, adjusted according to serum vancomycin, loading dose of 25 to 30 mg/kg for serious illness (maximum 2 g per dose)
Linezolid (if vancomycin cannot be used; specialist advice only)	3 months to 11 years, 10 mg/kg three times a day orally or intravenously (maximum 600 mg per dose) 12 to 17 years, 600 mg twice a day orally or intravenously

Notes

See over page.

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Choice of antibiotic: children and young people under 18 years, continued

Notes

For **all antibiotics**: see BNFC for use and dosing in specific populations, for example, hepatic impairment, renal impairment, pregnancy and breast-feeding, and administering intravenous (or, where appropriate, intramuscular) antibiotics. Oral doses are for immediate-release medicines. Prescribers to use age bands with other factors such as severity and child's size in relation to the average for 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 multi-drug resistant bacteria and recent contact with health or social care setting before current admission.

For **first- and alternative-choice oral antibiotics:** review treatment after a total of 5 days of antibiotics and consider stopping the antibiotic if clinically stable.

For **intravenous antibiotics**: review by 48 hours and consider switching to oral antibiotics for a total of 5 days and then review.

For **teicoplanin, vancomycin and linezolid:** see BNFC for information on monitoring of patient parameters and on therapeutic drug monitoring.

For **linezolid**: in September 2024 linezolid for children and young people under 18 years was an off-label use (see NICE's information on prescribing medicines).

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