Pyelonephritis (acute): antimicrobial prescribing

NICE National Institute for Health and Care Excellence

Pyelonephritis (acute)

- Send a midstream urine sample for culture and susceptibility testing for people aged 16 years and over
- Send a urine sample for culture and susceptibility testing in line with the NICE guideline on urinary tract infection for under 16s
- Offer an antibiotic
- Assess and manage fever in under 5s in line with the NICE guideline on fever in under 5s

Advise:

- **possible adverse effects of antibiotics include diarrhoea and nausea**
- **nausea with vomiting is also a possible indication of worsening pyelonephritis**
- **seeking medical help if symptoms worsen at any time or do not start to improve within 48 hours of taking the antibiotic, or the person becomes systemically very unwell**

When results of urine culture available:

- review the choice of antibiotic, and
- change antibiotic according to susceptibility results if bacteria are resistant, using a narrow spectrum antibiotic when possible

Reassess at any time if symptoms worsen or do not start to improve within 48 hours of taking the antibiotic, taking account of:

- **other possible diagnoses**
- **any symptoms or signs suggesting a more serious illness or condition, such as sepsis**
- **previous antibiotic use, which may have led to resistant bacteria**

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Refer to hospital if the person has any symptoms or signs of a more serious illness or condition (for example, sepsis)

Refer children and young people to hospital in line with the NICE guideline on urinary tract infections in under 16s

Consider referring or seeking specialist advice for people aged 16 years and over if they:

- are significantly dehydrated or unable to take oral fluids and medicines
- are pregnant
- have a higher risk of complications

NICE uses 'offer' when there is more certainty of benefit and 'consider' when evidence of benefit is less clear.

Self-care

- Advise paracetamol for pain, with possible addition of a low-dose weak opiod such as codeine for people over 12 years
- Advise drinking enough fluids to avoid dehydration

Background

- Pyelonephritis is an infection of one or both kidneys caused by bacteria travelling up from the bladder
- People at higher risk of complications include those with abnormalities of the genitourinary tract or underlying disease (such as diabetes or immunosuppression)

Antibiotics

- When prescribing antibiotics, take account of severity of symptoms, risk of complications, previous urine culture and susceptibility results, previous antibiotic use which may have led to resistant bacteria and local antimicrobial resistance data
- Give oral antibiotics first-line if people can take oral medicines, and the severity of their condition does not require intravenous antibiotics
- Review intravenous antibiotics by 48 hours and consider stepping down to oral antibiotics where possible

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Choice of antibiotic: non-pregnant women and men aged 16 years and over

Antibiotic[1]	Dosage and course length
First choice oral antibiotic[2]	
Cefalexin	500 mg twice or three times a day (up to 1 to 1.5 g three or four times a day for severe infections) for 7 to 10 days
Co-amoxiclav (only if culture results available and susceptible)	500/125 mg three times a day for 7 to 10 days
Trimethoprim (only if culture results available and susceptible)	200 mg twice a day for 14 days
Ciprofloxacin (consider safety issues[3])	500 mg twice a day for 7 days
First choice intravenous antibiotics (if vomiting, unable to take oral antibiotics, or severely unwell). Antibiotics may be combined if susceptibilty or sepsis a concern[2, 4]	
Co-amoxiclav (only in combination or if culture results available and susceptible)	1.2 g three times a day
Cefuroxime	750 mg to 1.5 g three or four times a day
Ceftriaxone	1 to 2 g once a day
Ciprofloxacin (consider safety issues[3])	400 mg twice or three times a day
Gentamicin	Initially 5 mg/kg to 7 mg/kg once a day, subsequent doses adjusted according to serum gentamicin concentration[5]
Amikacin	Initially 15 mg/kg once a day (maximum per dose 1.5 g once a day), subsequent doses adjusted according to serum amikacin concentration (maximum 15 g per course)[5]
Second choice intravenous antibiotic - consult local microbiologist	

[1] See BNF for appropriate use and dosing in specific populations, for example, hepatic impairment, renal impairment and breast-feeding, and administering intravenous antibiotics.
[2]Check any previous urine culture, susceptibility and prescribing and choose antibiotics accordingly.
[3] The European Medicines Agency's Pharmacovigilance Risk Assessment Committee has recommended restricting the use of fluoroquinolone antibiotics following a review of disabling and potentially long-lasting side effects mainly involving muscles, tendons, bones and the nervous system (press release October 2018), but they are an option in acute pyelonephritis which is a severe infection.
[4]Review intravenous antibiotics by 48 hours and consider stepping down to oral antibiotics.
[5]Therapeutic drug monitoring and assessment of renal function is required (BNF, August 2018).

Choice of antibiotic: pregnant women aged 12 years and over

Antibiotic[1]	Dosage and course length
First choice oral antibiotic[2]	
Cefalexin	500 mg twice or three times a day (up to 1 to 1.5 g three or four times a day for severe infections) for 7 to 10 days
First choice intravenous antibiotic (if vomiting, unable to take oral antibiotics, or severely unwell)[2, 3]	
Cefuroxime	750 mg to 1.5 g three or four times a day
Second choice antibiotics or combining antibiotics if susceptibility or sepsis a concern	
Consult local microbiologist	

[1] See BNF for appropriate use and dosing in specific populations, for example, hepatic impairment and renal impairment, and administering intravenous antibiotics.
[2]Check any previous urine culture and susceptibility results and antibiotic prescribing and choose antibiotics accordingly.
[3]Review intravenous antibiotics by 48 hours and consider stepping down to oral antibiotics where possible.

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.

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Choice of antibiotic: children and young people under 16 years

Antibiotic[1]	Dosage and course length[2]
Refer **children under 3 months** to paediatric specialist and treat with intravenous antibiotics in line with the NICE guideline on fever in under 5s	
Children aged 3 months and over - First choice oral antibiotic[3]	
Cefalexin	3 to 11 months, 12.5 mg/kg or 125 mg twice a day for 7 to 10 days (25 mg/kg two to four times a day [maximum 1 g per dose four times a day] for severe infections) 1 to 4 years, 12.5 mg/kg twice a day or 125 mg three times a day for 7 to 10 days (25 mg/kg two to four times a day [maximum 1 g per dose four times a day] for severe infections) 5 to 11 years, 12.5 mg/kg twice a day or 250 mg three times a day for 7 to 10 days (25 mg/kg two to four times a day [maximum 1 g per dose four times a day] for severe infections) 12 to 15 years, 500 mg twice or three times a day (up to 1 to 1.5 g three or four times a day for severe infections) for 7 to 10 days
Co-amoxiclav (only if culture results available and susceptible)	3 to 11 months, 0.25 ml/kg of 125/31 suspension three times a day for 7 to 10 days (dose doubled in severe infection) 1 to 5 years, 0.25 ml/kg of 125/31 suspension or 5 ml of 125/31 suspension three times a day for 7 to 10 days (dose doubled in severe infection) 6 to 11 years, 0.15 ml/kg of 250/62 suspension or 5 ml of 250/62 suspension three times a day for 7 to 10 days (dose doubled in severe infection) 12 to 15 years, 250/125 mg or 500/125 mg three times a day for 7 to 10 days
Children aged 3 months and over - First choice intravenous antibiotics (if vomiting, unable to take oral antibiotics or severely unwell). Antibiotics may be combined if susceptibility or sepsis a concern[3, 4, 5]	
Co-amoxiclav (only in combination or if culture results available and susceptible)	3 months to 15 years, 30 mg/kg three times a day (maximum 1.2 g three times a day)
Cefuroxime	3 months to 15 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 (maximum 1.5 g per dose) for severe infections
Ceftriaxone	3 months to 11 years (up to 50 kg), 50 to 80 mg/kg once a day (maximum 4 g per day); 9 to 11 years (50 kg and above), 1 to 2 g once a day; 12 to 15 years, 1 to 2 g once a day
Gentamicin	Initially 7 mg/kg once a day, subsequent doses adjusted according to serum gentamicin concentration[6]
Amikacin	Initially 15 mg/kg once a day, subsequent doses adjusted according to serum amikacin concentration[6]
Children aged 3 months and over - Second choice intravenous antibiotics - Consult local microbiologist	

[1] See BNF for children (BNFC) for appropriate use and dosing in specific populations, for example hepatic and renal impairment, and administering intravenous antibiotics. If a young women is pregnant, refer to the prescribing table on choice of antibiotic for pregnant women aged 12 years and over.
[2] 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.
[3] Check any previous urine culture and susceptibility results and antibiotic prescribing and choose antibiotics accordingly.
[4] Review intravenous antibiotics by 48 hours and consider stepping down to oral antibiotics where possible for a total of 10 days.
[5] If intravenous treatment is not possible, consider intramuscular treatment, if suitable.
[6] Therapeutic drug monitoring and assessment of renal function is required (BNFC, August 2018).

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