

**Antimicrobial Paediatric Guidelines  
North West Paediatric Allergy, Immunology and Infection Group  
Operation Delivery Network (NWPAlIG)**

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Changes	10.10.18 changes accepted no summary CefTRIAxone contraindication in sepsis and meningitis only (other * removed) and cefTRIAxone added to Osteomyelitis
Background	<p>The concept of a consensus network Antibiotic Paediatric Guideline was first discussed at the North West Paediatric Allergy, Immunology and Infection Group network educational event in September 2016. This scoped further and following a meeting in January 2017 the principles for this work were discussed and have been developed since by the Infection sub-group.</p> <p>The principles of using national guidance first with a hierarchy of NICE &gt; SIGN &gt; RCPCH &gt; National specialist society &gt; BNFC &gt; Cochrane &gt; Meta-analysis &gt; systematic review &gt; RCT &gt; other peer review research &gt; review &gt; local practice</p> <p>Where there are differing microbiological reasons for different antibiotic choices this is specifically mentioned.</p>
ACTION REQUIRED	<p>For consideration for adoption locally. Contacts for comments: <a href="mailto:suzanne.dixon@mft.nhs.uk">suzanne.dixon@mft.nhs.uk</a> and <a href="mailto:paddy.mcmaster@pat.nhs.uk">paddy.mcmaster@pat.nhs.uk</a></p> <p>If you wish to have a word copy of this document for local adaptation please contact: <a href="mailto:suzanne.dixon@mft.nhs.uk">suzanne.dixon@mft.nhs.uk</a>.</p>
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**Preface**

This guideline has been compiled as a tool for all staff concerned with the management of general paediatric patients, especially those who present as emergencies. The rationale for developing this tool is to ensure that practice is evidenced based, there is a range of different antibiotics used across the network area, and errors are made when staff move between organisations.

**Prescribing regimens:**

The administration of certain drugs, especially those given intravenously, requires great care if hazardous errors are to be avoided. These guidelines do not include all guidance on the indications, contraindications, dosage and administration for all drugs. Please refer to the British National Formulary for Children (BNFc) available as an app and/or consult a pharmacist.

**Antibiotics:**

Recommendations are based on national guidance reflecting a balance between common antibiotic sensitivities and the narrowest appropriate spectrum to avoid resistance. Where both an intravenous and oral preparation exist, give orally unless IV specified or patient unable to take orally.

**National guidelines:**

Where there are different recommendations the following order of prioritisation is followed:

NICE > SIGN > RCPCH > National specialist society > BNFC > Cochrane >

Meta-analysis > systematic review > RCT > other peer review research > review > local practice

**Evidence base:**

These have been written with reference to published medical literature and amended after extensive consultation. Wherever possible, the recommendations made are evidence based. Where no clear evidence has been identified from published literature the advice given represents a consensus of the expert authors and their peers and is based on their practical experience.

**Feedback:**

Evaluating the evidence-base of these guidelines involves continuous review of both new and existing literature. The editors encourage you to challenge the evidence provided in this document. If you know of evidence that contradicts, or additional evidence in support of the advice given in these guidelines please contact us.

The accuracy of the detailed advice given has been subject to exhaustive checks.

However, if any errors or omissions become apparent please contact us so these can be amended in the next review, or, if necessary, be brought to the urgent attention of users. Constructive comments or suggestions would also be welcome.

This document is shared with trusts for their use, the network would appreciate feedback on how this document has been used/ amended for local use.

**Therapeutic drug monitoring**

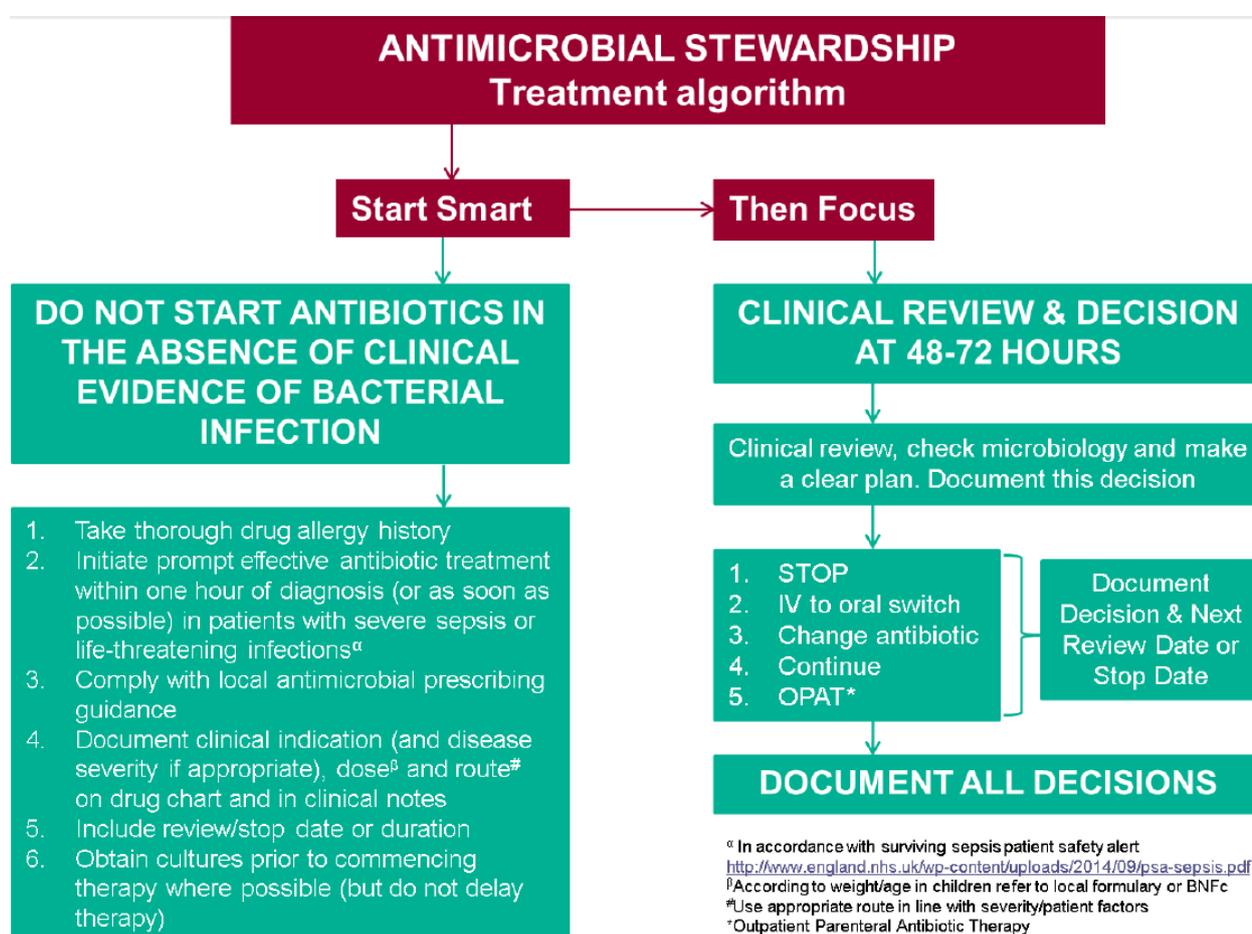
- Gentamicin
- Vancomycin
- Tobramycin
- Amikacin

Please be aware that these drugs require therapeutic monitoring. Refer to BNFC for guidance regarding timing of blood tests and acceptable ranges.

## Antimicrobial Stewardship

Reducing the impact of serious infections CQUIN 2018/19 FAQs, parts 2c and 2d March 2018

[https://improvement.nhs.uk/documents/2689/7\\_CQUIN\\_FAQs\\_1819\\_FINAL.pdf](https://improvement.nhs.uk/documents/2689/7_CQUIN_FAQs_1819_FINAL.pdf)



### GENERAL ANTIMICROBIAL PRESCRIBING ADVICE

- Do not start antimicrobials in the absence of clinical evidence of bacterial infection, and document the indication for the antimicrobial on the prescription.
- Initiate prompt treatment with effective antimicrobials for sepsis and severe or life-threatening infections as soon as possible and always within one hour of presentation.
- Use antimicrobials with an adequate spectrum of cover for the likely pathogens for less severe infections.
- If the child is <1 month and the local guidelines do not give specific recommendations for this age group, treat as per Sepsis of Unknown Origin guideline.
- Always use the optimal dosing regimen for the clinical indication and the patient's individual parameters.
- Consider the risk of resistant pathogens (e.g. MRSA or ESBL-producing organisms) and offer alternative treatment regimens accordingly, or seek advice from Infectious Diseases / Microbiology.
- Confirm allergy status and offer alternative treatment choices for patients intolerant of recommended antimicrobial agents. Patients with a history of anaphylaxis, urticaria or rash immediately after penicillin administration should not receive a penicillin, cephalosporin or other  $\beta$ -lactam antibiotic. If an alternative has not been suggested in this document, please discuss alternative antibiotic treatment with Infectious Diseases / Microbiology.

- Ensure that the appropriate specimens are taken for culture and sensitivity testing prior to commencing antibiotic treatment without causing delay to starting treatment in patients with severe sepsis or life-threatening infections.
- Consider intravenous (IV) administration only to patients who are severely ill, unable to tolerate oral treatment, or where oral therapy would not provide adequate coverage or tissue penetration (e.g. CNS infection).
- Consider switching IV antibiotics to the oral route of administration promptly according to local IV-to-oral switch policy
- Document the next review date or stop date on the prescription.
- It is essential to review antimicrobial prescriptions after 48-72 hours, and after a clinical review and checking microbiology results, a clear plan should be documented in the case notes, which should be: 1) Stop 2) IV to oral Switch 3) Change antibiotic 4) Continue and review again in 72 hours or 5) Out-patient Parenteral Antibiotic Therapy (OPAT).

### **ADHERENCE AND PALATABILITY**

The choice of oral antibiotic should account for factors potentially affecting adherence such as dosing frequency and palatability/taste of formulation. Palatable oral drugs in a sensible regimen (up to 3 times per day) should be used where possible, and middle of the night dosing of oral antibiotics should be avoided whenever possible, especially following discharge.

Oral liquids which should be avoided due to poor palatability include:

- Flucloxacillin oral liquid: consider using oral cefalexin liquid if patient cannot take flucloxacillin capsules
- Clindamycin oral liquid: consider using an alternative (may need to discuss suitable alternatives with Pharmacy or Infectious Diseases/ Microbiology).

### **Disclaimer**

These views represent the views of the North West Paediatric Allergy, Immunology and Infection Group Operational Delivery Network and were produced after careful consideration of available evidence in conjunction with multi-professional expertise and experience. It is intended that Trusts within the Network will adopt this guideline and educational resource after review through their own clinical governance structure.

If as an organisation you adopt all or part of this document please let us know. We will automatically let you know of any changes, otherwise it will be your responsibility to check and confirm when any changes are made.

The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.

**Document Originator:** North West Paediatric Allergy, Immunology and Infection Group Operational Delivery Network

**Name Title Organisation** North West Paediatric Allergy, Immunology and Infection Group Operational Delivery Network

**We would like to thank the wide range of professionals from across the Network who have read and commented on drafts of this document**

## 1. Sepsis

### 1.1 Sepsis of unknown origin

Age	Antibiotic	Penicillin allergy
<3 month	cefoTAXime or cefTRIAXone* + amoxicillin IV +/- aciclovir (see text)	If history of anaphylaxis to penicillin or cephalosporin ciprofloxacin IV + vancomycin
>3 month	cefoTAXime or cefTRIAXone +/- clindamycin IV/gentamicin (see text)	

\* **CefoTAXime:** contraindications to cefTRIAXone

- Concomitant treatment with intravenous calcium (including total parenteral nutrition containing calcium) in premature and full-term neonates
- full-term neonates with jaundice, hypoalbuminaemia, acidosis, unconjugated hyperbilirubinaemia, or impaired bilirubin binding
- premature neonates less than 41 weeks corrected gestational age

**Gentamicin:** add if -

- Severe sepsis requiring inotropes/critical care
- Suspected or confirmed urinary tract infections
- Likely resistant organisms (such as pseudomonas)

**Toxic Shock:** add clindamycin

**Neonatal Units** follow Neonatal Guidelines, usually benzylpenicillin and gentamicin

**Immunosuppression:** use febrile neutropenia guidance

**Amoxicillin:** Stop once Listeria infection is excluded (very rare >1 month)

**Aciclovir:** <2 months old with raised ALT, seizure, suspected meningitis, maternal primary HSV

**Duration:**

- minimum 5 days if rapid response; usually 7-10 days; longer *S aureus*, slow response, undrainable foci, immune deficiency

**Cultures:**

- Obtain appropriate cultures before starting antibiotic treatment as soon as possible, and always within 1 hour of presentation.
- Check previous microbiology results to determine if recent antibiotic-resistant organisms have been identified and contact the Infectious Diseases / Microbiology if:
  - patient has a previous history of carriage or infection with antibiotic-resistant organisms (e.g. Extended Spectrum Beta-Lactamase (ESBL) expressing organisms)
  - prolonged/multiple antibiotic use in the previous 3 months
  - patient has been overseas in the previous 3 months
- Once causative organism known amend antibiotic choice and duration
- Consider stopping antibiotics if there is no growth from cultures after 36 hours.

**Organisms:**

- <3 months: Group B streptococcus, *Escherichia coli* (rarely *Listeria monocytogenes*, *Haemophilus influenzae*, *Streptococcus pneumoniae*, *Klebsiella spp.*, *Salmonella spp.*, *Staphylococcus aureus*, *Enterococcus spp.*)
- >3 months: Meningococcus, pneumococcus, *Staphylococcus aureus*, (rarely *Haemophilus influenzae*, *Klebsiella spp.*, *Salmonella spp.*, *Enterococcus spp.*)

NICE Sepsis Recognition, Diagnosis, Management. July 2016 <https://www.nice.org.uk/guidance/NG51>

RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> edition p340

Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016

## 1.2 Suspected central line associated bloodstream infection

	Antibiotic	Penicillin allergy
Empiric	glycopeptide (e.g. teicoplanin) and cefTRIAXone +/- gentamicin if history of pseudomonas	glycopeptide (e.g. teicoplanin) and gentamicin
Coagulase negative staphylococcus	glycopeptide (e.g. teicoplanin)	
Staphylococcus aureus	flucloxacillin IV	glycopeptide (e.g. teicoplanin)
MRSA	glycopeptide (e.g. teicoplanin)	
Enterococcus	amoxicillin IV (if sensitive) glycopeptide (e.g. teicoplanin) if amoxicillin resistant	glycopeptide (e.g. teicoplanin)
Candida spp <i>Candida</i> <i>krusei/glabrata/lusitaneae</i>	liposomal amphotericin echinocandin e.g. capsfungin	

**Cultures:** take repeat blood cultures from CVC when the laboratory calls to say there is a positive blood culture. **Two positive blood cultures with the same organism are highly suggestive of CVC infection.** Repeat blood cultures (both CVC and peripheral) if fever persists and the child is not improving clinically

**Prompt removal of all non-tunnelled venous catheters associated with confirmed blood stream infection is recommended. Remove line if *Staphylococcus aureus* or *Candida* CVC infection, or if persistently positive blood cultures, despite treatment.**

**Line lock:** improves the chance of saving the Central Venous Catheter (CVC). Line locks are not useful in CVCs which have been inserted <14 days previously. Antibiotic line-lock should be locked into the catheter lumen for as long as possible (up to 24 hours), during periods when the catheter is not being used. The antibiotic lock should be aspirated before the line is used for other infusions. The amount instilled should be equivalent to the priming volumes printed on the catheter or clamp, but as a guide, the volume of antibiotic line locks prescribed should be no more than 1ml for children under 2 years, and 2 ml for children 2 years and above. Suitable antibiotics for line locks; vancomycin (for Gram positive infections), aminoglycosides (for Gram negative infections) – discuss sensitivities with microbiology. Alcohol locks can be used if no organism identified (see local protocol).

### Duration:

if line removed: coagulase negative staphylococci: stop antibiotics once line removed

other organisms discuss with microbiology/infectious diseases

if line stays in situ:

- coagulase negative staphylococci 7 days
- enterococci 10 days
- staphylococcus aureus, gram negatives 14 days from 1<sup>st</sup> negative blood culture

*RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> edition p97*

*Clinical Practice Guidelines for Diagnosis and Management of Intravascular Catheter-Related Infection:2009 Update by the Infectious Diseases Society of America Clin Infect Dis 2009 Jul 1; 49(1):1-45*

### 1.3 Haematology / Oncology and other immunocompromised sepsis

	Antibiotic
Neutropenic sepsis 1 <sup>st</sup> line	piperacillin with tazobactam add amikacin if septic shock or Manchester Oncology patient
Neutropenic sepsis 2 <sup>nd</sup> line (already on piperacillin/tazobactam) Or non-anaphylactic allergy to penicillin	meropenem add amikacin if septic shock or Manchester Oncology patient (If history of anaphylaxis to penicillin – seek microbiology advice)
Non-neutropenic oncology	piperacillin with tazobactam
Non-neutropenic oncology 2 <sup>nd</sup> line Or on methotrexate	meropenem

**Organisms:** *Staphylococcus aureus*, Streptococci, coliforms, *Pseudomonas aeruginosa*

See patient's previous organisms cultured and empiric treatment should cover recent isolates

NICE. Neutropenic sepsis: prevention and management in people with cancer. Clinical guideline [CG151]

Published date: September 2012 <https://www.nice.org.uk/guidance/cg151>

Department of Health expert advisory group Antimicrobial Prescribing, Resistance & Healthcare---Associated Infections Chair  
Public Health England English Surveillance Programme for Antimicrobial Use And Resistance Oversight group Chair 2017

Local resistance English surveillance programme for antimicrobial utilisation and resistance (ESPAUR) report

<https://www.gov.uk/government/publications/english-surveillance-programme-antimicrobial-utilisation-and-resistance-espaur-report>

### 2. Respiratory tract infections

**No antibiotic prescribing for:**

Acute - sore throat / pharyngitis / tonsillitis / rhinosinusitis, viral induced wheeze, asthma

Offer patients:

- reassurance that antibiotics are not needed immediately because they will make little difference to symptoms and may have side effects, for example, diarrhoea, vomiting and rash
- a clinical review if the respiratory tract infection (RTI) worsens or becomes prolonged

Offer all patients: advice about the usual natural history of the illness and average total illness length:

– acute sore throat, pharyngitis, tonsillitis: 1 week

NICE. Respiratory tract infections (self-limiting): prescribing antibiotics. [CG69] 2008

<https://www.nice.org.uk/guidance/cg69>

### 2.1 Community acquired pneumonia

Age	Mild/Moderate	Severe	Penicillin allergy
all	amoxicillin PO 5 days	co-amoxiclav (7 days) + macrolide	macrolide if severe add ciprofloxacin

Only give IV if unable to take antibiotics orally for severe pneumonia

**Features of severe disease include:**

- |  |  |
|--|--|
| - oxygen saturation <92%, cyanosis                             | - significant tachycardia for level of fever |
| - respiratory rate infants >70; older children >50 breaths/min | - difficulty in breathing                    |
| - prolonged central capillary refill time >2 s                 | - intermittent apnoea, grunting              |
|  | - not feeding; signs of dehydration          |
|  | - chronic conditions                         |

**Organisms:** Respiratory viruses

Bacteria: *Streptococcus pneumoniae*, *Haemophilus influenzae* *Mycoplasma pneumoniae*

British Thoracic Society guidelines for the management of community acquired pneumonia in children: update 2011 [http://thorax.bmj.com/content/66/Suppl\\_2/ii1.full](http://thorax.bmj.com/content/66/Suppl_2/ii1.full)

## 2.2 Aspiration pneumonia

Antibiotic	Penicillin allergy	Duration
co-amoxiclav	clindamycin	7 days

**Organisms:** *Staphylococcus aureus*, Streptococci, coliforms, anaerobes  
*RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> edition p409*

## 2.3 Hospital acquired pneumonia and complex cases

Treat pneumonia onset <4 days of admission as per community acquired pneumonia guidelines.

	Antibiotic	Penicillin allergy	Duration
1 <sup>st</sup> line	co-amoxiclav	ciprofloxacin	7 days
2 <sup>nd</sup> line	piperacillin/ tazobactam switch to co-amoxiclav when afebrile	ciprofloxacin + clindamycin	7 days
<i>Pseudomonas</i>	cefTAZidime + gentamicin	ciprofloxacin + gentamicin	7 days

**Organisms:** *Staphylococcus aureus*, coliforms (rarely *Pseudomonas aeruginosa*)

*British Society for Antimicrobial Chemotherapy. Guidelines for the management of hospital-acquired pneumonia in the UK. Journal of Antimicrobial Chemotherapy (2008) 62, 5–34*

## 2.4 Bronchiectasis

Send sputum for culture. Target therapy to previous culture results if available

		Antibiotic	Penicillin allergy	Duration
No <i>pseudomonas</i>	1 <sup>st</sup> line	amoxicillin	macrolide	7 days
<i>H. influenzae</i>		co-amoxiclav		7 days
Severely unwell		cefTRIAxone		7-14 days
<i>Pseudomonas</i>	1 <sup>st</sup> episode	ciprofloxacin		7 days
<i>Pseudomonas</i>	Chronic	cefTAZidime + tobramycin	ciprofloxacin + tobramycin	7 days

Review treatment after 7 days and either stop the antibiotic if clinically stable or continue for a further 7 days as appropriate.

*NICE guideline NG10114. Bronchiectasis (non-cystic fibrosis), acute exacerbation: antimicrobial prescribing. 2018*

## 2.5 Empyema

Antibiotic	Oral continuation	Penicillin allergy	Duration
ceFUroxime IV + clindamycin IV/PO	co-amoxiclav	ciprofloxacin + clindamycin	IV until chest drains removed and child is afebrile; minimum 2 weeks, 4 weeks if loculated

**Organisms:** *Streptococcus pneumoniae*, *Staphylococcus aureus*, Group A Streptococcus

*BTS guidelines for management of pleural infection in children. Thorax 2005;60 (Suppl 1):i1–i21*  
<https://www.brit-thoracic.org.uk/standards-of-care/guidelines/>

## 2.6 Influenza

Suspected influenza: fever, coryza, generalised symptoms (headache, malaise, myalgia, arthralgia) when high prevalence of influenza

Complicated: requiring hospital admission

No severe immunosuppression	
Uncomplicated	No treatment (or oseltamivir if risk of complications)
Complicated	oseltamivir (1 <sup>st</sup> line) zanamivir (2 <sup>nd</sup> line)

Severe immunosuppression	Low risk oseltamivir resistance (e.g. A(H3N2), B)	High risk oseltamivir resistance (e.g. A(H1N1))
Uncomplicated	oseltamivir	zanamivir inhaler Or oseltamivir (if unable to use inhaler)
Complicated	oseltamivir (1 <sup>st</sup> line) zanamivir (2 <sup>nd</sup> line)	zanamivir inhaler/nebuliser/IV

**Duration:** uncomplicated 5 days; prophylaxis and complicated 10 days

*PHE guidance on use of antiviral agents for the treatment and prophylaxis of influenza v7.0*

<https://www.gov.uk/government/publications/influenza-treatment-and-prophylaxis-using-anti-viral-agents>

## 2.7 Pertussis

	Antibiotic	Duration	Contraindication to macrolide
Macrolide	azithromycin	5 days	Cotrimoxazole
	clarithromycin	7 days	

*RCPC Manual of Childhood Infections 2016 4<sup>th</sup> edition p742*

## 3. ENT Infections

**No antibiotic prescribing for:**

- acute otitis media
- acute sore throat / acute pharyngitis / acute tonsillitis
- common cold
- acute rhinosinusitis
- acute cough/acute bronchitis

Offer patients:

- reassurance that antibiotics are not needed immediately because they will make little difference to symptoms and may have side effects, for example, diarrhoea, vomiting and rash
- a clinical review if the respiratory tract infection (RTI) worsens or becomes prolonged

Offer all patients: advice about the usual natural history of the illness and average total illness length:

- acute otitis media: 4 days
- acute sore throat / acute pharyngitis / acute tonsillitis: 1 week
- common cold: 1 ½ weeks
- acute rhinosinusitis: 2 ½ weeks
- acute cough/acute bronchitis: 3 weeks

*NICE. Respiratory tract infections (self-limiting): prescribing antibiotics. [CG69] 2008*

<https://www.nice.org.uk/guidance/cg69>

### 3.1 Otitis media

No or delayed antibiotic prescribing followed by clinical review 48-72 hours later with re-evaluation

Consider immediate antibiotic prescribing in children:

- <2 yrs with bilateral acute otitis media (AOM)
- Marked otorrhoea with AOM (not caused by external otitis)
- Who are systemically unwell
- Symptoms/signs of serious illness and/or complications (mastoiditis/ abscess/ intracranial complications)
- High risk of pre-existing illness (e.g. significant heart, lung, renal, liver or neuromuscular disease, immunosuppression, cystic fibrosis, prematurely born infants and toddlers)

	Antibiotic	Penicillin allergy/ notes
Otitis media	<b>No antibiotic for acute otitis media usually required</b>	
Severe acute otitis media	amoxicillin < 2yrs- 7-10 days >2 yrs- 5 days	macrolide If PO administration difficult cefTRIAXone 1-3 days
Chronic otitis media	ciprofloxacin ear drops	

**Organisms:** Respiratory viruses  
Bacteria: *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*,  
Group A Streptococcus

NICE. Respiratory tract infections (self-limiting): prescribing antibiotics. [CG69] 2008

<https://www.nice.org.uk/guidance/cg69>

RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> edition p371

Management and treatment of common infections. PHE 2017

### 3.2 Otitis externa

	Antibiotic	Penicillin allergy
Uncomplicated	acetic acid 2% 2 drops 8 hourly 10 days	
Extensive	flucloxacillin (7 days) co-amoxiclav if unable to take tablets	macrolide
Malignant otitis externa	ceftazidime + ciprofloxacin ear drops 7 days	

**Organisms:** *Staphylococcus aureus*, Group A streptococcus  
Malignant: Pseudomonas

Clinical practice guideline: acute otitis externa. Otolaryngol Head Neck Surg 2014;150: 161–8 (1 Suppl):S1–24

<https://www.ncbi.nlm.nih.gov/pubmed/24491310>

### 3.3 Tonsillitis

#### No antibiotics/ delayed antibiotic prescribing unless NICE criteria met as above (ENT Infections)

Consider antibiotics if  $\geq 4$  FeverPAIN criteria met:

- Fever (during previous 24 hours)
- Purulence (pus on tonsils)
- Attend rapidly (within 3 days after onset of symptoms)
- Severely Inflamed tonsils
- No cough or coryza (inflammation of mucus membranes in the nose)

Avoid amoxicillin if Epstein-Barr virus suspected (adolescent, headache, lymphadenopathy, hepatosplenomegaly, hepatitis)

	Antibiotic	Penicillin allergy
Severe tonsillitis FeverPAIN $\geq 4$	penicillin V (5 days or 10 days if recurrent) amoxicillin (6 days) if unable to take tablets	macrolide
Peri-tonsillar / retro-pharyngeal abscess	co-amoxiclav IV then oral step down (7 days)	clindamycin (7 days)

**Organisms:** Respiratory viruses, Epstein-Barr virus  
Bacteria: Group A streptococcus

NICE. Sore throat (acute): antimicrobial prescribing NG84 Jan 2018  
RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> edition p372 & 624

### 3.4 Epiglottitis

Age	Antibiotic	Penicillin allergy
All	cefoTAXime or cefTRIAXone then co-amoxiclav oral step down (total 5 days)	ciprofloxacin IV + clindamycin IV

**Organisms:** *Haemophilus influenzae* type b (rare: notify Public Health for contact prophylaxis), *Streptococcus pneumoniae*, *Staphylococcus aureus*, Group A streptococcus

RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> edition p556

### 3.5 Acute lymphadenitis

**No antibiotics:** well child with few systemic symptoms

Avoid amoxicillin (in co-amoxiclav) if EBV suspected (adolescent, pharyngitis, headache, hepatosplenomegaly, hepatitis)

Age	1 <sup>st</sup> line antibiotic	2 <sup>nd</sup> line/ penicillin allergy	Duration
>1 month	co-amoxiclav	clindamycin	7 days minimum

**Organisms:** Respiratory viruses, Epstein Barr Virus  
Bacteria: Group A streptococcus, *Staphylococcus aureus*, TB (refer to TB specialist)

RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> edition p135-146 & 624

### 3.6 Acute mastoiditis

	Antibiotic	Penicillin allergy	Duration
Initial IV	cefTRIAxone + clindamycin	ciprofloxacin +	2 weeks
Oral switch	co-amoxiclav once improving	clindamycin	

**Organisms:** *Streptococcus pneumoniae*, Group A streptococcus, *Staphylococcus aureus* (*Pseudomonas aeruginosa* rarely)

Algorithmic management of paediatric acute mastoiditis. [Int J Pediatr Otorhinolaryngol.](#) 2012 Jun;76(6):791-6  
Clinical strategies for the management of acute mastoiditis in the pediatric population. [Clin Pediatr \(Phila\).](#) 2010 Feb;49(2):110-5

### 3.7 Sinusitis (acute and chronic)

**No antibiotics** unless:

- Systemically very unwell
- Symptoms or signs suggestive of serious illness and/or complications
- High risk of serious complications due to pre-existing illness (e.g. significant heart, lung, renal, liver or neuromuscular disease, immunosuppression, cystic fibrosis and prematurely born infants)

	1 <sup>st</sup> line Antibiotic	Penicillin allergy	Duration
Acute	penicillin V amoxicillin (if unable to take tablets)	macrolide	5 days
Chronic	co-amoxiclav	clindamycin	10 days

**Organisms:** Respiratory viruses

Bacteria: *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*

NICE Sinusitis (acute): antimicrobial prescribing Oct 2017 <http://nice.org.uk/guidance/ng79>

RCPCH Manual of Childhood Infections 4<sup>th</sup> Edition, p408

### 3.8 Dental infection

Age	Antibiotic	Penicillin allergy	Duration
All	co-amoxiclav	macrolide and metronidazole	5 days

**Organisms:** Group A streptococcus, Viridans streptococci, anaerobes

## 4. Ophthalmology infections

### 4.1 Conjunctivitis

Indication	Antibiotic
Acute bacterial	No antimicrobial treatment required
Purulent conjunctivitis	azithromycin eye drops or chloramphenicol eye ointment for 3 days
Herpes simplex	<1 month old: aciclovir IV 14 days >1 month old: aciclovir 3% eye ointment topical or aciclovir oral 7-14 days Refer to ophthalmologist
Ophthalmia neonatorum	cefTRIAxone single dose + azithromycin eye drops or chloramphenicol eye ointment for 3 days
Chlamydia	erythromycin* PO 14 days

\*erythromycin macrolide of choice in neonates but be aware increases the risk of pyloric stenosis

RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> Edition p501

Ophthalmia neonatorum <https://www.college-optometrists.org/guidance/clinical-management-guidelines/ophthalmia-neonatorum.html>

### 4.2 Pre-septal (peri-orbital) and orbital cellulitis

Indication	Antibiotic	Penicillin allergy
Pre-septal: mild	co-amoxiclav <b>or</b> clindamycin 5 days	clindamycin
Pre-septal: severe	co-amoxiclav IV <b>or</b> ceFUroxime for 24-48h then co-amoxiclav PO 7 days	clindamycin + ciprofloxacin
Orbital cellulitis	cefTRIAxone <b>and</b> metronidazole 14 days minimum	
Orbital cellulitis immunocompromised not responding to antibiotics	Add liposomal amphotericin	

**Organisms:** Sinus origin: *Streptococcus pneumoniae*, *Haemophilus influenzae*  
Skin origin: *Staphylococcus aureus*, haemolytic streptococci,  
Abscess: Anaerobic streptococci (including *Streptococcus milleri*)

Treat as orbital cellulitis if unsure if pre-septal or orbital cellulitis, if pre-septal step down to co-amoxiclav

RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> Edition p156-159

## 5. Central Nervous system infections

### 5.1 Meningitis

#### i. Empirical therapy for suspected or confirmed bacterial meningitis

Age	Antibiotic	Penicillin allergy
<3 month	cefoTAXime or cefTRIAXone* (high dose) and amoxicillin IV +/- aciclovir (see below)	If history of anaphylaxis to penicillin or cephalosporin ciprofloxacin IV + vancomycin
>3 month	cefTRIAXone IV	

**Lumbar puncture** unless contraindicated and start antimicrobial therapy <1 hour of presentation

\***cefoTAXime** if <41 wks corrected gestational age; acidotic, jaundiced or hypoalbuminaemic neonates

Stop **amoxicillin** if Listeria not grown after 48 hrs, Listeria rare >1 month old

Add **vancomycin** if recent travel outside UK or recent prolonged antibiotic exposure within past 3 months

Add **aciclovir** IV <3 weeks old and rash, deranged LFTs or clotting; focal neurological symptoms or encephalopathy

Give **dexamethasone** 0.15 mg/kg to a maximum dose of 10 mg, four times daily for 4 days for children >3 month old if ≤12 hr from first antibiotics and LP shows:

- Frankly purulent CSF
- CSF WBC count >1000/μl
- Raised CSF WBC + protein >1 g/L
- Bacteria on Gram stain

**Notify** suspected bacterial meningitis: inform local Public Health England team by phone within 24 hours to co-ordinate chemoprophylaxis with ciprofloxacin single dose

#### ii. Continuing empiric treatment for culture negative bacterial meningitis

Age	Antibiotic	Pen/ceph anaphylaxis	Duration
All	cefTRIAXone	ciprofloxacin IV	Minimum 10 days

#### iii. Organism-specific guidance

**Please note:** If clinical course complicated, discuss with Infection Specialist

Age	Organism	Antibiotic	Pen/ceph anaphylaxis	Duration
<3 months	<i>Group B streptococcus</i>	cefoTAXime or cefTRIAXone	vancomycin	Minimum 14 days
	<i>Listeria monocytogenes</i>	amoxicillin IV + gentamicin	vancomycin + gentamicin	amoxicillin 21 days, gentamicin 7 days
	<i>Gram negative bacilli</i>	cefoTAXime or cefTRIAXone	ciprofloxacin	Minimum 21 days
>3 months	<i>Haemophilus influenzae type b</i>	cefTRIAXone	ciprofloxacin	Total 10 days
	<i>Streptococcus pneumoniae</i>	cefTRIAXone	vancomycin	Total 14 days
All	<i>Neisseria meningitidis</i> (confirmed OR unconfirmed but clinically suspected)	cefTRIAXone	ciprofloxacin	Total 7 days
All	<i>Mycobacterium tuberculosis</i>	Discuss with paediatric TB specialist		
All	Fungal meningitis	Discuss with Paediatric Infectious Diseases		

NICE guidelines: Management of bacterial meningitis and meningococcal septicaemia in Secondary care  
<https://www.nice.org.uk/guidance/cg102> (last updated February 2015)

RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> Edition p49

Empirical antibiotic cover for *Listeria monocytogenes* infection beyond the neonatal period: a time for change? *Arch Dis Child* May 2015 Vol 100 No 5

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.842.9708&rep=rep1&type=pdf>

## 5.2 Encephalitis

Presentation	Treatment	Duration
Fever and encephalopathy	Aciclovir IV	21 days

**Meningoencephalitis:** see Meningitis above and give aciclovir IV too

**Aciclovir dose:** whole course must be IV. Adjust dose for renal failure, Encephalitis dose (See BNFC: neonate - 3 months: 20 mg/kg; 3 months-12 years: 500mg/m<sup>2</sup>; >12 years: 10 mg/kg)

Management of suspected viral encephalitis in children - Association of British Neurologists and British Paediatric Allergy, Immunology and Infection Group National Guidelines *Journal of Infection* (2012) 64, 449-477

## 5.3 Neurosurgical infections

Presentation	Antibiotic (IV)	Penicillin allergy
Ventricular shunt infection	cefoTAXime or cefTRIAXone <b>and</b> vancomycin 10 days	meropenem <b>and</b> vancomycin
Penetrating craniocerebral injury (inc depressed skull fracture)	ceFUroxime and metronidazole 5 days if no meningitis	
Brain Abscess / subdural empyema	cefTRIAXone <b>and</b> metronidazole 6 weeks	
Post operative meningitis	meropenem and vancomycin 2-3 weeks	

### Organisms:

- External ventricular drain infection: coagulase negative streptococci
- Ventricular shunt infections: coagulase negative streptococci, *Staphylococcus aureus*, diphtherioids, streptococci, coliforms
- Injuries: *Staphylococcus aureus*
- Abscess: anaerobic streptococci (including *Streptococcus milleri*), *Staphylococcus aureus*, streptococci, coliforms, *Pseudomonas aeruginosa* (flucloxacillin can be discontinued if no *Staph aureus* isolated)

RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> Edition p 408

Consensus document on controversial issues for the treatment of infections of the central nervous system: bacterial brain abscesses. *International Journal of Infectious Diseases* 14S4 (2010) S79-S92

## 6. Intra-abdominal infections

Indication (all ages)	1 <sup>st</sup> line Antibiotic	Penicillin allergy
Peritonitis & abscess (including appendicitis)	cefoTAXime / cefTRIAXone + metronidazole or co-amoxiclav IV if not septic PO step down 3-7 days (longer if non-drainable abscess)	metronidazole + gentamicin + glycopeptide (e.g. teicoplanin)
Pelvic inflammatory disease	cefTRIAXone (for 24 hrs after clinical improvement) + doxycycline (>12 yrs old) or macrolide <12 yrs old and metronidazole PO 14 days	gentamicin + metronidazole (for 24 hrs after clinical improvement) to metronidazole PO + doxycycline (>12 yrs old) or macrolide <12 yrs old) 14 days
Sexual assault (needs assessment)	cefTRIAXone IV/IM (single dose) + macrolide (e.g. azithromycin) PO (single dose) + metronidazole PO (single dose)	macrolide (e.g. azithromycin) PO (single dose) + metronidazole PO (single dose)
Necrotising enterocolitis	amoxicillin + cefoTAXime / cefTRIAXone + metronidazole (5 days)	
Campylobacter	Only if severe infection/immunocompromised macrolide 5 days	
Clostridium difficile	metronidazole 10-14 days (not for asymptomatic carriage)	
Salmonella (non-typhoidal)	Only if chronic GI tract disease, haemoglobinopathy, malignancies or immunocompromised (check sensitivities): macrolide 5 days cefTRIAXone 5 days (if septicaemic)	
Shigella	macrolide 5 days cefTRIAXone 5 days (if severe)	

### Organisms:

Peritonitis: coliforms, enterococci, anaerobic streptococci (including *Streptococcus milleri*),  
Pelvic Inflammatory Disease: Gonococcus, *Chlamydia trachomatis*, streptococci, coliforms, anaerobes

RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> Edition p409, 452, 495, 808, 820

British Association for Sexual Health and HIV. UK National Guideline for the Management of Pelvic Inflammatory Disease 2018 <https://www.bashhguidelines.org/media/1170/pid-2018.pdf>

British Association for Sexual Health and HIV. UK National Guidelines on the Management of Adult and Adolescent Complainants of Sexual Assault 2011 <https://www.bashhguidelines.org/media/1079/4450.pdf>

Diagnosis and Management of Complicated Intra-abdominal Infection in Adults and Children: Guidelines by the Surgical Infection Society and the Infectious Diseases Society of America Clinical Infectious Diseases 2010; 50:133–64 [https://www.idsociety.org/uploadedFiles/IDSA/Guidelines-Patient\\_Care/PDF\\_Library/Intra-abdominal%20Infectin.pdf](https://www.idsociety.org/uploadedFiles/IDSA/Guidelines-Patient_Care/PDF_Library/Intra-abdominal%20Infectin.pdf)

## 7. Urinary Tract infections

This applies to empiric treatment for infants and children not already known to have significant pre-existing uropathies - look up previous organisms and sensitivities OR contact microbiology for advice regarding treatment for these patients. For patients on prophylactic antibiotics- always use different antibiotic for acute infection. Prophylaxis: select based on sensitivity results. Send urine specimen for culture before starting antibiotics

Age	Cystitis/ lower UTI	Acute pyelonephritis/ upper UTI
<3 months	As per sepsis guideline for antibiotic choice AND duration	
>3 months	nitrofurantoin (tablets only) or co-amoxiclav or cefalexin for 3 days	If outpatient: co-amoxiclav or cefalexin (penicillin allergy ciprofloxacin) If septic: gentamicin stat dose then ceftriaxone then ciprofloxacin PO (if no organism identified) If hospital acquired: temocillin 7-10 days total

**Organisms:** *E. coli*, Proteus, Klebsiella, Enterococci, Pseudomonas, *Staphylococcus aureus*

Urinary tract infection in under 16s: diagnosis and management. Clinical guideline [CG54] Published date: August 2007 updated 2017 <https://www.nice.org.uk/guidance/CG54/chapter/1-Guidance>  
Local resistance data

## 8. Bone and joint infections

### 8.1 Osteomyelitis and septic arthritis

**Unifocal** disease indicates “simple” disease at a single site.

**Complex** disease includes: multifocal, significant bone destruction, resistant or unusual pathogen, immunosuppression, sepsis or shock (see Sepsis guidance).

Age	Antibiotic (use high doses)	PO switch in simple disease when organism unknown (use high doses)	Duration
<3 months	ceftazidime or ceftriaxone	After 14-21 days if: <ul style="list-style-type: none"> <li>Afebrile AND pain free minimum 24 hrs AND</li> <li>CRP &lt;20 OR decreased by ≥2/3 highest value</li> </ul> co-amoxiclav or cefalexin	3-4 weeks in septic arthritis, 4-6 weeks in osteomyelitis Complex disease IV to oral switch after 14 days; may require >6 weeks of treatment. Consult orthopaedics
≥3 months- ≤5 years	ceftazidime IV	After 72 hours if: <ul style="list-style-type: none"> <li>Afebrile AND pain free minimum 24 hrs AND</li> <li>CRP &lt;20 OR decreased by ≥2/3 highest value</li> </ul> <b>3 months-5 yrs:</b> co-amoxiclav or cefalexin <b>6-8 yrs:</b> flucloxacillin (co-amoxiclav only if flucloxacillin not tolerated) <b>8-19 yrs:</b> flucloxacillin or clindamycin	
≥ 6 years	flucloxacillin IV or clindamycin IV		
<b>Penicillin allergy</b>	clindamycin		
<b><i>S. aureus</i></b>	flucloxacillin + fusidic acid		
<b>Prosthesis</b>	flucloxacillin + rifampicin		
<b>Sickle cell</b>	add ciprofloxacin		

**Organisms:**

- <3 months: *Staphylococcus aureus*, Group B streptococcus
- 3 months – 5 years: *Kingella kingae*, *Staphylococcus aureus*, beta-haemolytic streptococci, *Streptococcus pneumoniae*, meningococcus, (rarely *Haemophilus influenzae* type B)
- >5 years: *Staphylococcus aureus*, beta-haemolytic streptococci (groups A, C, G)

RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> Edition p65

Managing bone and joint infection in children Arch Dis Child 2012;97:545-553

## 9. Skin and soft tissue infection

### 9.1 Impetigo

		Penicillin allergy
Localised	1% hydrogen peroxide topically	
Widespread	flucloxacillin (capsules only) or co-amoxiclav (suspension)	macrolide

*RCPCH Manual of Childhood Infections 4<sup>th</sup> Edition p827*

### 9.2 Cellulitis

Severity (all ages)	1 <sup>st</sup> line antibiotic	Penicillin allergy	MRSA
Mild	flucloxacillin (capsules only) or cefalexin (suspension) 5-7 days	clindamycin (capsules) or macrolide (suspension)	Check sensitivities: clindamycin (capsules) or macrolide (suspension)
Severe/ systemically unwell	flucloxacillin IV 5-7 days (in severe sepsis add clindamycin)	clindamycin IV or PO (capsules)	glycopeptide (e.g. teicoplanin)

**Duration:** according to response (IV to oral switch when responding, minimum 5 days total)

**Organisms:** *Staphylococcus aureus*, beta-haemolytic streptococci (groups A, C, G)

**Toxic shock:** see Sepsis and discuss IVIG with local approval team

**Scarlet fever:** penicillin V 10 days, or amoxicillin 5 days if unable to take tablets

*RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> Edition p302*

### 9.3 Necrotising fasciitis

1 <sup>st</sup> line Antibiotic	Penicillin allergy
piperacillin / tazobactam or cefTRIAXone + clindamycin IV	glycopeptide (e.g. teicoplanin) + clindamycin IV + gentamicin IV

Urgent surgical debridement essential

Local authorisation required for IVIG

**Organisms:** *Staphylococcus aureus*, Group A streptococcus and other beta-haemolytic streptococci, coliforms, anaerobes

*RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> Edition p303-304*

### 9.4 Human/animal bites

Indication	Antibiotic	Penicillin allergy	Duration
Prophylaxis	co-amoxiclav PO	Penicillin allergy: ciprofloxacin and clindamycin	7 days
Infected bites	co-amoxiclav if severely infected		

**Tetanus:** ask about immunisation status and administer vaccine if not received within past 10 years

**Organisms:** *Pasteurella multucida* (animal bites), *Staphylococcus aureus*, streptococci, anaerobes

*RCPCH Manual of Childhood Infections 2016 4<sup>th</sup> Edition p305*

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