

**Reference Number:** FOI202122418  
**From:** Other  
**Date:** 29 December 2021  
**Subject:** Paediatric antibiotic guidelines

- Q1 The UK Paediatric Antimicrobial Stewardship Committee is currently trying to assess and improve antibiotic prescribing in the UK. We are asking all Trusts to provide a copy of their inpatient paediatric antibiotic guideline. Please provide a copy of the inpatient paediatric antibiotic guideline at Alder Hey Hospital.
- A1 [Please see attached document: FOI418 Antimicrobial Prescribing Guidelines](#)

# Antimicrobial Prescribing Guidelines



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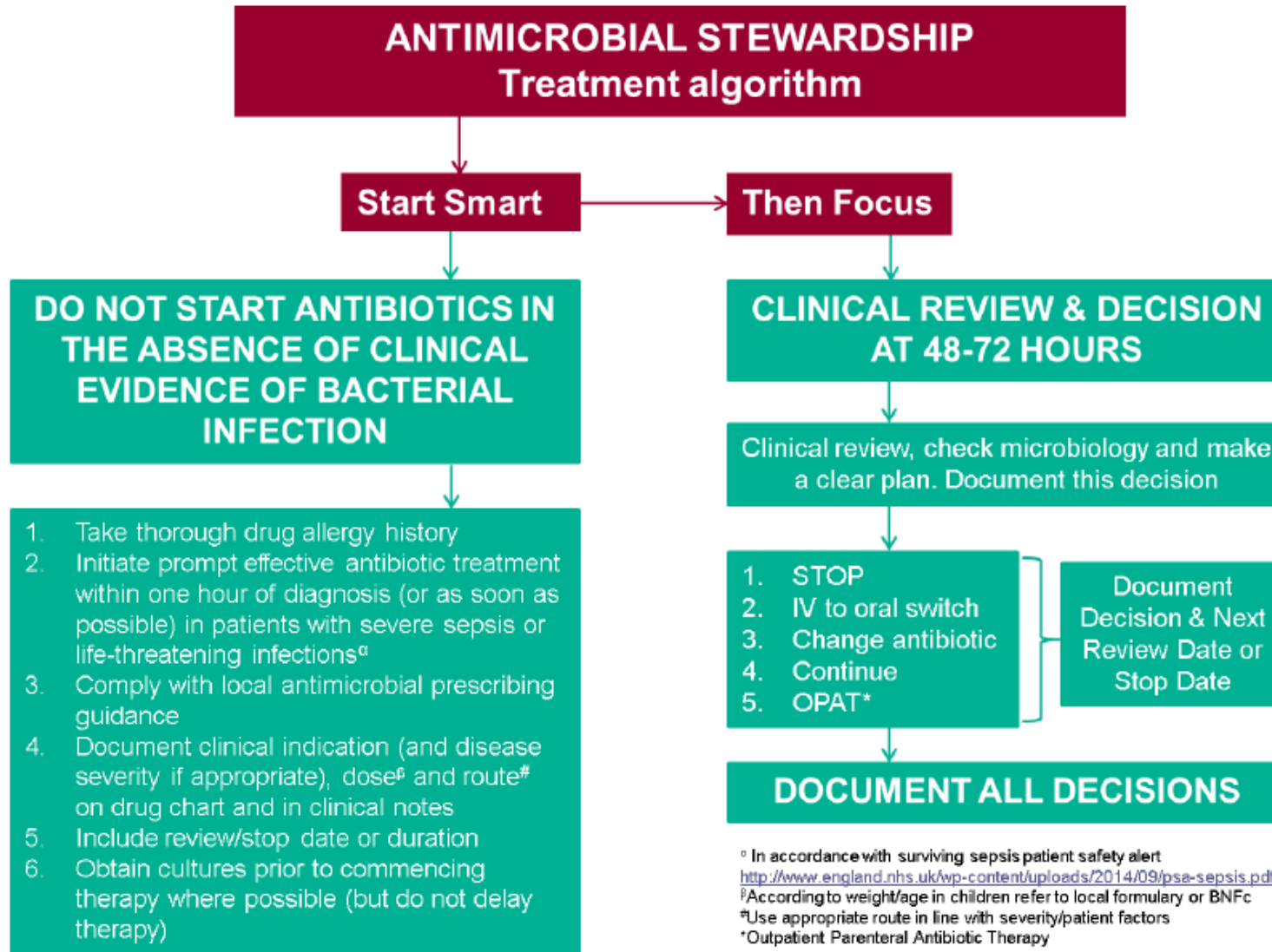
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# **PART I: EMPIRICAL TREATMENT GUIDELINES**

# START SMART - THEN FOCUS: SUMMARY OF BEST PRACTICE FOR ANTIMICROBIAL TREATMENT

[Start Smart - Then Focus](#) is a key Department of Health publication on best practice of antimicrobial prescribing.

The key recommendations for antimicrobial treatment are summarised in the algorithm below.



## 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).
- For infections listed as 'H' on Meditech microbiology report please see High Dose Antibiotic Table on page 7
- 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).

## HIGH DOSE ANTIBIOTICS

This information is intended to provide dosing guidance when infections are reported as 'H' on the Meditech microbiology report. A susceptibility category of 'H' indicates that specific dosing is required in order for the antibiotic to effectively treat the infecting organism.

The doses advised in this reference are appropriate for patients with normal renal and hepatic function. If there is known or suspected renal or hepatic impairment please contact pharmacy for further advice.

Some of these doses may not be appropriate for patients at extremes of bodyweight – please consider accordingly and if necessary contact pharmacy for further advice.

ANTIBIOTIC	ROUTE OF ADMINISTRATION	PATIENT AGE	RECOMMENDED HIGH DOSE
Amikacin	Intravenous	All ages	None – refer to aminoglycoside pathway *Must not be used as single agent*
Amoxicillin	Intravenous	Neonate up to 7 days	50mg/kg* every 12 hours
		Neonate 7 days to 28 days	50mg/kg* every 8 hours
		<b>* For meningitis please refer to the BNFc</b>	
		Child (up to 40kg)	50mg/kg (max 2g) every 4 hours
	Oral	Adult (40kg and above)	2g every 4 hours
		Neonate 7 days to 28 days	30mg/kg (max 125mg) 3 times a day
		Child 1 month – 4 years	30mg/kg 3 times a day
		Child 5 – 11 years	30mg/kg (max 1g) 3 times a day
		Child 12 years - Adult	1g 3 times a day
Aztreonam	Intravenous	Neonate up to 7 days	30mg/kg every 12 hours
		Neonate 7 days – Child 23 months	30mg/kg every 6 hours
		Child 2-11 years	50mg/kg (max 2g) every 6 hours
		Child 12 years - Adult	2g every 6 hours
Ceftazidime	Intravenous	Neonate up to 7 days	50mg/kg every 24 hours
		Neonate 7 to 20 days	50mg/kg every 12 hours
		Neonate 21 to 28 days	50mg/kg every 8 hours
		Child (up to 40kg)	50mg/kg (max 2g) every 8 hours
		Adult (40kg and above)	2g every 8 hours
Cefuroxime	Intravenous	Neonate up to 7 days	50mg/kg every 12 hours
		Neonate 7 days to 20 days	50mg/kg every 8 hours
		Neonate 21 days to 28 days	50mg/kg every 6 hours
		Child (1month – 30kg)	50mg/kg (max 1.5g) every 8hours
		Adult (30kg and above)	1.5g every 8 hours



Ciprofloxacin	Intravenous	Neonate	10mg/kg every 12 hours
		Child	10mg/kg (max 400mg) every 8 hours
		Adult	400mg every 8 hours
	Oral	Neonate	15mg/kg BD
		Child	20mg/kg (max 750mg) BD
		Adult	750mg BD
Co-Amoxiclav	Intravenous	Neonate	30mg/kg every 12 hours
		Child 1-2 months	30mg/kg every 12 hours
		Child 3 months – 17 years	30mg/kg (max 1.2g) every 8 hours
		Adult	1.2g every 8 hours
	Oral	Child 2 – 23 months	0.3mL/kg BD of 400/57 oral suspension
		Child 2 – 6 years (13 – 21kg)	5mL BD of 400/57 oral suspension
		Child 7 – 12 years (22 – 40kg)	10mL bd of 400/57 oral suspension
		Child 12 years – Adult (41kg and above)	10mL TDS using 400/57 suspension
Co-Trimoxazole**	Intravenous	Child 6 weeks – 17 years	27mg/kg (max 1.44g) every 12 hours
		Adult	1.44g every 12 hours
	Oral	6 weeks – 11 years	24mg/kg BD
		12 years - Adult	960mg BD
		<b>**For <i>Pneumocystis jirovecii</i> (PCP) infection please refer to the BNFc</b>	
Gentamicin	Intravenous	All ages	None – as per aminoglycoside pathway *Must not be used as a single agent*
Meropenem	Intravenous	Neonate up to 7 days	40mg/kg every 12 hours as <b>extended 3 hour infusion***</b>
		Neonate 7 days – Child (up to 50kg)	40mg/kg every 8 hours as <b>extended 3 hour infusion***</b>
		Child (50kg and above) – Adult	2g every 8 hours as <b>extended 3 hour infusion***</b>
Piperacillin- Tazobactam	Intravenous	Neonate	90mg/kg every 8 hours given as an <b>extended 3 hour infusion***</b>
		Child 1 month – 11 years (up to 50kg)	90mg/kg (max 4.5g) every 6 hours given as an <b>extended 3 hour infusion***</b>
		Child 12 years - Adult (50kg and above)	4.5g every 6 hours (max dose 4.5g every 6 hours) given as an <b>extended 3 hour infusion***</b>

\*\*\* For antibiotics requiring administration as an extended 3 hour infusion please document this as a dose instruction on the Meditech 6 prescription and refer nursing staff to the Paediatric Injectable Therapy Guidelines for further information.

## 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 swallow flucloxacillin capsules
- **Clindamycin oral liquid:** consider using an alternative (may need to discuss suitable alternatives with Pharmacy or Infectious Diseases/Microbiology)

# SEPSIS

(Suspected serious infection of unknown cause)

## SEPSIS (COMMUNITY ACQUIRED)

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Birth-1 month	Group B Streptococcus <i>Escherichia coli</i> <i>Listeria monocytogenes</i> <i>Haemophilus influenzae</i> <i>Streptococcus pneumoniae</i> <i>Klebsiella spp.</i> <i>Salmonella spp.</i> <i>Staphylococcus aureus</i> <i>Enterococcus spp.</i>	IV <a href="#">Cefotaxime</a> + IV <a href="#">Amoxicillin</a> *	IV <a href="#">Cefotaxime</a> refer to BNFC  IV Amoxicillin: less than 7 days: 50mg/kg/dose every 12 hours 7-28 days: 50mg/kg/dose every 8 hours	Review at 36-48 hours and consider stopping antibiotics.  Culture negative sepsis: Up to 5 days  Culture positive sepsis: See appropriate guidance below.	<b>Obtain appropriate cultures before starting antibiotic treatment as soon as possible, and always within 1 hour of presentation.</b>  <b>Check previous microbiology results to determine if recent antibiotic-resistant organisms have been identified and contact the Infectious Diseases / Microbiology if:</b> - 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 is known (usually within 24 hours) antibiotic choice and duration should be amended if necessary.
1 month and above	<i>Escherichia coli</i> <i>Haemophilus influenzae</i> <i>Streptococcus pneumoniae</i> <i>Klebsiella spp.</i> <i>Salmonella spp.</i> <i>Staphylococcus aureus</i> <i>Neisseria meningitidis</i>	IV <a href="#">Cefotaxime</a>  <b>Unless</b> immunosuppression: Use oncology febrile neutropenia guidance on antimicrobials	IV <a href="#">Cefotaxime</a> 50mg/kg (max 3g) every 6 hours	*Stop amoxicillin at 36 hours once <i>Listeria meningitis</i> is excluded.	

If IV access is unavailable, if appropriate, prescribe IM ceftriaxone until IV access obtained.

For preterm neonates less than 41 weeks corrected gestational age ceftriaxone is contraindication so prescribe IM cefotaxime instead.

Note: Intramuscular injections should only be prescribed if safe to do, eg, patients with low platelets may not be suitable.

# SEPSIS

(Suspected serious infection of unknown cause)

## SEPSIS (HOSPITAL ACQUIRED) WITHOUT A CENTRAL LINE

Greater than 4 days hospitalisation

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Less than 3 months	<i>Staphylococcus aureus</i> <i>Enterococcus spp.</i> Enterobacteriaceae <i>Pseudomonas spp.</i>	IV <a href="#">Vancomycin</a> plus IV <a href="#">Ciprofloxacin</a>	IV <a href="#">Vancomycin</a> : refer to local Vancomycin Dosing and Monitoring Guidelines on the intranet  IV <a href="#">Ciprofloxacin</a> : refer to BNFC	Review at 36-48 hours and consider stopping antibiotics.	<b>Obtain appropriate cultures before starting antibiotic treatment as soon as possible, and always within 1 hour of presentation.</b>  <b>Check previous microbiology results to determine if recent antibiotic-resistant organisms have been identified and contact the Infectious Diseases / Microbiology if:</b> - 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
3 months and above	<i>Staphylococcus aureus</i> <i>Enterococcus spp.</i> Enterobacteriaceae <i>Pseudomonas spp.</i>	IV <a href="#">Teicoplanin</a> plus IV <a href="#">Ciprofloxacin</a>	IV <a href="#">Teicoplanin</a> : loading dose 10mg/kg (max 800mg) every 12 hours for 3 doses, followed 24 hours later by a maintenance dose of 10mg/kg (max 800mg) once daily  IV <a href="#">Ciprofloxacin</a> : refer to BNFC	Culture negative sepsis: Up to 5 days  Culture positive sepsis: See appropriate guidance below.	Once causative organism is known (usually within 24 hours) antibiotic choice and duration should be amended if necessary.

# SEPSIS

(Suspected serious infection of unknown cause)

## SUSPECTED CENTRAL LINE ASSOCIATED BLOODSTREAM INFECTION (CLABSI)

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION	NOTES
Less than 3 months	Coag. negative Staphylococci <i>Staphylococcus aureus</i> <i>Enterococcus spp.</i> Enterobacteriaceae	IV <a href="#">Vancomycin</a> plus IV <a href="#">Ciprofloxacin</a>	IV <a href="#">Vancomycin</a> : refer to local Vancomycin Dosing and Monitoring Guidelines on the intranet  IV <a href="#">Ciprofloxacin</a> : refer to BNFC	7 - 14 days	<b>Obtain blood cultures from the central line before starting antibiotic treatment. Start antibiotics as soon as possible, and always within 1 hour of presentation.</b>  <b>Check previous microbiology results to determine if recent antibiotic-resistant organisms have been identified and contact the Infectious Diseases / Microbiology if:</b> - 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
3 months and above	Coag. negative Staphylococci <i>Staphylococcus aureus</i> <i>Enterococcus spp.</i> Enterobacteriaceae	IV <a href="#">Teicoplanin</a> plus IV <a href="#">Gentamicin</a>  <b>Unless</b> immunosuppression: Use oncology <i>febrile neutropenia</i> guidance on antimicrobials	IV <a href="#">Teicoplanin</a> : loading dose 10mg/kg (max 800mg) every 12 hours for 3 doses, followed 24 hours later by a maintenance dose of 10mg/kg (max 800mg) once daily  IV <a href="#">Gentamicin</a> : refer to local Aminoglycoside Dosing and Monitoring Guidelines on the intranet	7 - 14 days	<b>Repeat Blood Cultures</b> should be taken from CVC when the laboratory calls to say there is a positive blood culture. <b>Two positive blood cultures with the same organism are highly suggestive of CVC infection.</b> Blood cultures (both CVC and peripheral) should also be repeated if fever persists and the child is not improving clinically.  Review choice and duration of antibiotic therapy when culture and sensitivities are available, see next page.

# SEPSIS

## (Suspected serious infection of unknown cause)

### CONFIRMED CENTRAL LINE ASSOCIATED BLOODSTREAM INFECTION (CLABSI)

ORGANISM	CHOICE OF ANTIMICROBIAL	CHOICE OF LINE-LOCK	DURATION (from last negative blood culture)
<i>Enterococcus spp.</i>	IV <a href="#">Amoxicillin</a> if sensitive PLUS Vancomycin line-locks Or IV <a href="#">Teicoplanin</a> OR IV <a href="#">Vancomycin</a> , PLUS Vancomycin line-locks	Vancomycin line-locks	7 - 10 days
Coagulase negative Staphylococci	IV <a href="#">Teicoplanin</a> Or IV <a href="#">Vancomycin</a>	Vancomycin line-locks	7 - 10 days
<i>Staphylococcus aureus</i>	IV <a href="#">Flucloxacillin</a>	Vancomycin line locks	14 days
MRSA	IV <a href="#">Vancomycin</a> (see also MRSA policy)	Vancomycin line-locks	14 days
Gram negative organisms	Refer to ID / microbiology	Refer to ID / microbiology	10 – 14 days
<i>Candida spp</i>	IV <a href="#">Liposomal Amphotericin</a>	-	14 days

**Prompt removal of all non-tunnelled venous catheters associated with confirmed blood stream infection is recommended.**

**Antibiotic Line-lock Therapy** improves the chance of saving the Central Venous Catheter (CVC). Line locks are not useful in CVCs which have been inserted <14 days previously. Bacteria in a biofilm within the lumen of the CVC need high concentrations of antibiotics to kill them. 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 2years, and 2ml for children 2 years and above:

Antibiotic Line-Lock	Concentration	Preparatory notes
Amikacin	2mg/ml	Withdraw 0.4mL from a 100mg/2mL ampoule and further dilute to 10mL with sodium chloride 0.9% to give a 2mg/mL solution.
Ciprofloxacin	2mg/ml	Use neat 2mg/ml injection solution
Gentamicin	1mg/ml	Withdraw 1ml from a Gentamicin 20mg/2ml ampoule and further dilute to 10ml with Sodium Chloride 0.9% to produce a 1mg/ml solution.
Vancomycin	5mg/ml	Reconstitute 500mg vial of vancomycin with water for injections as described in the local injectable therapy guidelines to give a 50mg/mL solution. Further dilute 1mL of the 50mg/mL solution to 10mL with sodium chloride 0.9% to give a 5mg/mL solution.

## BONE AND JOINT INFECTIONS

### OSTEOMYELITIS AND SEPTIC ARTHRITIS

**Unifocal** disease indicates "simple" disease at a single site, whereas **Complex** disease includes any of the following: multifocal, significant bone destruction, resistant or unusual pathogen, immunosuppression.

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Birth-3 months	Group B Streptococcus <i>Staphylococcus aureus</i> <i>Kingella kingae</i>	IV <a href="#">Cefotaxime</a> + IV <a href="#">Flucloxacillin</a> *	Refer to BNFC and use maximum doses allowed according to age and weight	4-6 weeks	Consider IV to oral switch after 14 days for unifocal disease and after 21 days in complex disease.  Considerations for IV to oral switch: clinical improvement, afebrile and oral fluids and medication can be established and CRP<20 or decreased by 66% of the highest value.  Oral antibiotic choice based on microbiology culture and sensitivity results, or if an organism has not been identified, use <a href="#">cefalexin</a> as an oral stepdown and use the maximum dose allowed according to age/weight.  *IV <a href="#">Clindamycin</a> in penicillin allergy.
3 months to 5 years	<i>Staphylococcus aureus</i> Group B Streptococcus <i>Kingella kingae</i>	IV <a href="#">Cefuroxime</a>	IV <a href="#">Cefuroxime</a> 50mg/kg (max. 1.5g) every 6 hours	3 weeks for septic arthritis  4-6 weeks in unifocal osteomyelitis  At least 6 weeks in complex osteomyelitis	In unifocal disease consider IV to oral switch after 48 hours.  In complex disease consider IV to oral switch after 14 days unless there is significant bone destruction as this often requires more than 6 weeks of IV antibiotics.  Considerations for IV to oral switch: clinical improvement, afebrile and oral fluids and medication can be established and CRP<20 or decreased by 66% of the highest value.
5 years and above	<i>Staphylococcus aureus</i> <i>Streptococcus spp.</i>	IV <a href="#">Flucloxacillin</a> *	IV <a href="#">Flucloxacillin</a> 50mg/kg (max. 2g) every 6 hours	3 weeks for septic arthritis  4-6 weeks in unifocal osteomyelitis  At least 6 weeks in complex osteomyelitis	Oral antibiotic choice based on microbiology culture and sensitivity results, or if an organism has not been identified, use <a href="#">cefalexin</a> as an oral stepdown and use the maximum dose allowed according to age/weight.  *IV <a href="#">Clindamycin</a> in penicillin allergy.

# CARDIOVASCULAR INFECTIONS

## INFECTIVE ENDOCARDITIS

**If endocarditis suspected;** obtain 3 blood cultures by separate venipunctures on the first day, if there is no growth by the second day of incubation, obtain 2 or 3 more. In patients who are not acutely ill and whose blood culture remain negative, withholding antibiotic drugs for 48 hours or more while additional blood cultures are obtained may be considered to determine the cause of endocarditis.  
In patients who are severely ill and unstable, 3 separate venipunctures for blood cultures should be performed over 1 to 2 hours.

Contact Infectious Diseases / Microbiologist for advice, and refer to the [American Heart Association Scientific Statement: Infective Endocarditis in Childhood](#)



## CENTRAL NERVOUS SYSTEM INFECTIONS

**MENINGITIS** Please refer to [Guidelines for the Management of Suspected Bacterial Meningitis and Septicaemia](#) for guidance on recognition, investigation and management

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Birth-1 month	<p>Group B Streptococcus  <i>Escherichia coli</i>  <i>Listeria monocytogenes</i>  <i>Neisseria meningitidis</i>  <i>Haemophilus influenzae</i>  <i>Streptococcus pneumoniae</i>                      Herpes simplex virus                      Varicella zoster virus</p>	<p>IV <a href="#">Cefotaxime</a>                      +                      IV <a href="#">Amoxicillin</a>*</p>	<p>Refer to BNFC and use maximum dose allowed according to age and weight</p>	<p>See table below (ages 0-1 month)</p>	<p><b>Obtain appropriate cultures before starting antibiotic treatment. Start antibiotics within 1 hour of diagnosis for life threatening infections.</b></p> <p>Add IV <a href="#">Aciclovir</a> only if seizures, focal neurological symptoms or known exposure to HSV infection. Continuation of aciclovir must be reviewed by a Consultant within 24 hours.</p> <p>Once causative organism is known (usually possible after 24 hours) therapy must be adjusted according to table below.</p> <p>*Stop amoxicillin once <i>Listeria meningitis</i> is excluded.</p> <p>Contact the Infectious Diseases / Microbiology team if:</p> <ul style="list-style-type: none"> <li>- causative organism cannot be identified</li> <li>- patient has history of prolonged/multiple antibiotic use</li> </ul> <p>Bacterial meningitis is a notifiable disease. The local Public Health England team should be informed by phone within 24 hours to co-ordinate chemoprophylaxis (see page 14 for contact details).</p>
1 month and above	<p><i>Neisseria meningitidis</i>  <i>Haemophilus influenzae</i>  <i>Streptococcus pneumoniae</i></p>	<p>IV <a href="#">Cefotaxime</a></p>	<p>IV <a href="#">Cefotaxime</a>                      50mg/kg (max 3g)                      every 6 hours</p>	<p>Depends on organism (see notes**)</p>	<p><b>Obtain appropriate cultures before starting antibiotic treatment. Start antibiotics within 1 hour of diagnosis for life threatening infections.</b></p> <p>Add IV <a href="#">Aciclovir</a> only if seizures, focal neurological symptoms or known exposure to HSV infection. Continuation of aciclovir must be reviewed by a Consultant within 24 hours.</p> <p>**Duration of cefotaxime depends on causative organism (7 days for <i>N. meningitidis</i>, 10 days for <i>H. influenzae</i> and 14 days for <i>S. pneumoniae</i>).</p> <p>Contact the Infectious Diseases / Microbiology team if:</p> <ul style="list-style-type: none"> <li>- patient has previous history of carriage or infection with antibiotic-resistant organisms.</li> <li>- causative organism cannot be identified</li> <li>- patient has been overseas in the previous 3 months</li> <li>- patient has had prolonged/multiple antibiotic use in the previous 3 months.</li> </ul> <p>Bacterial meningitis is a notifiable disease. The local Public Health England team should be informed by phone within 24 hours to co-ordinate chemoprophylaxis (see page 14 for contact details).</p>

## CENTRAL NERVOUS SYSTEM INFECTIONS

### MENINGITIS continued...

**1. WHETHER TO TREAT WITH ANTIBIOTICS**

Unless contraindicated, a lumbar puncture should be performed to confirm diagnosis of meningitis.

All patients with suspected or proven meningitis should receive prompt antimicrobial therapy and always within 1 hour of presentation.

**2. CHOICE OF ANTIBIOTIC**

To ensure complete eradication of meningococcus from the nasopharynx, all patients with meningococcal disease should receive a single dose of ciprofloxacin as soon as they are able to tolerate oral therapy.

**Meningitis age 0-1 month:**

Once causative organism is known treat as follows:

ORGANISM	CHOICE OF ANTIMICROBIAL	SUGGESTED DURATION OF THERAPY	NOTES
Empirical (organism not known)	IV <a href="#">Cefotaxime</a> + IV <a href="#">Amoxicillin</a>	21 days depending on severity	
Group B Streptococcus	IV <a href="#">Cefotaxime</a>	14 days	If complicated, continue Cefotaxime for 21 days.
<i>Listeria monocytogenes</i>	IV <a href="#">Amoxicillin</a> + IV <a href="#">Gentamicin</a>	21 days OR until clinical improvement maximum of 7 days	
Gram negative bacilli	IV <a href="#">Cefotaxime</a>	21 days	Longer duration of Cefotaxime if complicated case.
<i>Neisseria meningitidis</i>	IV <a href="#">Cefotaxime</a>	7 days	
<i>Haemophilus influenzae</i>	IV <a href="#">Cefotaxime</a>	10 days	
<i>Streptococcus pneumoniae</i>	IV <a href="#">Cefotaxime</a>	14 days	
Herpes simplex	IV <a href="#">Aciclovir</a>	21 days	Refer to Infectious Diseases / Microbiology for advice on duration
Herpes zoster	IV <a href="#">Aciclovir</a>	-	Refer to Infectious Diseases / Microbiology for advice on duration

# CENTRAL NERVOUS SYSTEM INFECTIONS

## MENINGITIS continued...

### 3. USE OF STEROIDS

Dexamethasone should be given if strong evidence of bacterial meningitis. NICE guidance defines this as:

- frankly purulent CSF
- CSF white blood cell count greater than 1000/ $\mu$ L
- raised CSF white blood cell count with protein concentration greater than 1 g/L
- bacteria on Gram stain.

Do **not** use steroids in children less than 1 month old.

Do **not** start dexamethasone more than 12 hours after starting antibiotics.

Do **not** use steroids if tuberculosis is suspected.

The first dose should be given immediately before, or with the first dose of antibiotics in patients with meningitis with no rash (to exclude those with meningococcal disease).

If dexamethasone was not given before, or with the first dose of antibiotics, but was indicated as described above, try to ensure that the first dose of dexamethasone is given within 4 hours of starting antibiotics, but do **not** start dexamethasone more than 12 hours after starting antibiotics.

After the first dose of dexamethasone, discuss the need to continue steroid treatment with a consultant (a longer duration increases the risk of side effects, especially gastrointestinal haemorrhage).

Dosage: Dexamethasone phosphate IV 0.15 mg/kg/dose given four times a day for 2-4 days

### 4. RECOMMENDATIONS FOR PREVENTION OF SECONDARY CASES AMONG FAMILY CONTACTS

Bacterial meningitis is a notifiable disease. The local Public Health England team should be informed by phone within 24 hours to co-ordinate chemoprophylaxis:

Telephone number - Merseyside (Cheshire and Merseyside HPT):

**Monday-Friday 9.00 am-5.00 pm** (excluding Bank Holidays) - 0344 225 0562 select option 1

**Out of Hours** - On call cover 5.00 pm-9.00 am weekdays and all day at weekends and Bank Holidays - Call 0151 434 4819 - Ask for On-call Public Health

Contact details for PHE teams in other regions can be found at [www.gov.uk/guidance/contacts-phe-health-protection-teams](http://www.gov.uk/guidance/contacts-phe-health-protection-teams)

# CENTRAL NERVOUS SYSTEM INFECTIONS

## NEUROSURGERY ANTIBIOTIC TREATMENT GUIDELINES

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
<b>INFECTION IN EXTERNAL VENTRICULAR DRAIN</b>					
All	Coagulase negative Staphylococcus	INTRAVENTRICULAR Vancomycin	See below	10 days	
<b>INFECTION IN VENTRICULAR SHUNT PENETRATING CRANIOCEREBRAL INJURIES (INCLUDING DEPRESSED SKULL FRACTURE)</b>					
All	Coagulase negative Staphylococcus <i>Staphylococcus aureus</i> Coliforms <i>Streptococcus spp.</i> <i>Propionibacterium acnes</i> <i>Corynebacterium spp</i>	IV <a href="#">Cefotaxime</a> + INTRAVENTRICULAR Vancomycin	IV <a href="#">Cefotaxime</a> : refer to BNFC for neonatal doses. All other age groups should have 50mg/kg (max 3g) every 6 hours  Intraventricular vancomycin: see below.	10 days	Remove shunt and replace with plain external ventricular drain (EVD).  For intraventricular doses, see notes below. <b>INFECTION IN VENTRICULAR SHUNT</b>
<b>PENETRATING CRANIOCEREBRAL INJURIES (INCLUDING DEPRESSED SKULL FRACTURE)</b>					
All	<i>Staphylococcus aureus</i>  However, the predisposing injury influences the range of potential pathogens.	IV <a href="#">Cefuroxime</a> + IV <a href="#">Metronidazole</a>	IV <a href="#">Cefuroxime</a> 50mg/kg (max 1.5gram) every 8 hours  IV <a href="#">Metronidazole</a> : Refer to BNFC	Review at 5 days, duration will depend on whether or not meningitis is present	Debride scalp and skull but only remove superficial brain that is clearly non-viable. Remove readily accessible fragments/foreign bodies. Deeper fragments should not be sought if it means causing damage to the brain. Ensure watertight dural closure; use a periosteal graft or facia lata if needed. Care must be taken in potentially infected situations with artificial dura.

### INTRAVENTRICULAR DRUG DOSES

#### **VANCOMYCIN (prepared doses available from pharmacy):**

- Neonate: 10mg once every 24 hours
- Child 1 month-18 years: 10mg once every 24 hours

Note: For all children, reduce to 5mg daily if ventricular size reduced or increase to 15 - 20mg once daily if ventricular size increased.

**GENTAMICIN:** The use of Intraventricular Gentamicin is not recommended

## CENTRAL NERVOUS SYSTEM INFECTIONS

### NEUROSURGERY ANTIBIOTIC TREATMENT GUIDELINES (continued)

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
<b>BRAIN ABSCESS/SUBDURAL EMPYEMA</b>					
All	Streptococcus spp. Enterobacteriaceae <i>Staphylococcus aureus</i>	IV <a href="#">Cefotaxime</a> + IV <a href="#">Metronidazole</a> + (IV <a href="#">Vancomycin</a> if post-trauma or post-op)	For <a href="#">Cefotaxime</a> and <a href="#">Metronidazole</a> doses refer to BNFc and use maximum dose allowed according to age and weight.  Refer to local <a href="#">Vancomycin</a> Dosing and Monitoring Guidelines if using Vancomycin	Approx. 6 weeks. A longer duration may be required if the abscess has not been aspirated.	Insert central venous catheter /PICC line  Can be converted to IV ceftriaxone once daily and oral metronidazole once the patient has improved (with view to OPAT).  Patient may be converted to oral after 2 weeks, if: 1) abscess drained, 2) good clinical response and 3) organism and sensitivities known.
<b>POST OPERATIVE MENINGITIS</b>					
All	Empirical therapy	IV <a href="#">Cefotaxime</a> + IV <a href="#">Vancomycin</a>	Refer to BNFc and use maximum dose allowed according to age and weight for <a href="#">Cefotaxime</a> dose.  Refer to local IV <a href="#">Vancomycin</a> Dosing and Monitoring Guidelines if using IV Vancomycin	2-3 weeks depending on clinical response	Consult ID/Micro for optimal therapy choices and duration when causative organism is known

## DENTAL AND MAXILLOFACIAL INFECTIONS

### DENTAL ABSCESS

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	Group A Streptococcus Viridans Streptococci Anaerobes	Oral / IV <a href="#">Co-amoxiclav</a>	Refer to BNFc	5 days	If there is an obvious collection of pus this needs incision and drainage +/- extraction of causative tooth.  Choice in penicillin allergy; <a href="#">Clarithromycin</a> plus <a href="#">Metronidazole</a>

### SALIVARY GLAND INFECTION

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	Staphylococcus aureus Streptococci Anaerobes	Oral / IV <a href="#">Co-amoxiclav</a>	Refer to BNFc	5 days	Consider ultra sound scan to exclude collection of pus within infected gland. Any collection identified may need surgical drainage.  Choice in penicillin allergy; <a href="#">Clarithromycin</a> plus <a href="#">Metronidazole</a>

## EAR, NOSE AND THROAT INFECTIONS

### ACUTE OTITIS MEDIA

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	<i>Streptococcus pneumoniae</i> <i>Haemophilus influenzae</i>	Oral <a href="#">Amoxicillin</a>	Refer to BNFC	5 days	In patients who do not have severe otitis media, consider delayed antibiotic treatment (collected at parent's discretion after 72 hours if child has not improved).  Longer course may be required in very young children or in severe infection.  If penicillin allergic, use oral <a href="#">Clarithromycin</a> .

### EPIGLOTTITIS

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	<i>Haemophilus influenzae</i> <i>Staphylococcus aureus</i> <i>Streptococcus pneumoniae</i>	IV <a href="#">Cefotaxime</a>	Refer to BNFC	5 days	Consider oral <a href="#">Co-amoxiclav</a> if well after 3 days of IV therapy unless culture and sensitivity results indicate otherwise, or <a href="#">Clarithromycin</a> if penicillin allergic.  If H. influenzae type b is the causative organism discuss the use of chemoprophylaxis for index case and close contacts with Public Health England: <b>Monday-Friday 9.00 am-5.00 pm</b> (excluding Bank Holidays) - 0344 225 0562 option 1 <b>Out of Hours</b> - On call cover 5.00 pm-9.00 am weekdays and all day at weekends and Bank Holidays - Call 0151 434 4819 - Ask for On-call Public Health

## EAR, NOSE AND THROAT INFECTIONS

### SINUSITIS

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	<i>Streptococcus pneumoniae</i> <i>Haemophilus influenzae</i>	Oral <a href="#">Amoxicillin</a>	Refer to BNFC	5 days	If penicillin allergic, use oral <a href="#">Clarithromycin</a> .  Patients presenting with symptoms for 10 days or less should not be offered antibiotics.  Note: The Antimicrobial Stewardship Committee decided to continue with the use of amoxicillin suspension rather than phenoxymethylpenicillin suspension for palatability reasons.

### ACUTE LYMPHADENITIS

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Greater than 1 month	<i>Staphylococcus aureus</i> Group A <i>Streptococcus</i> Anaerobes	Oral / IV <a href="#">Co-amoxiclav</a>	Refer to BNFC	7 days	Use IV for severe disease / unable to tolerate orals Switch to oral when tolerating  Choice in penicillin allergy: <a href="#">Clarithromycin</a> plus <a href="#">Metronidazole</a>

### ACUTE MASTOIDITIS

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Greater than 1 month	<i>Streptococcus spp.</i> <i>Haemophilus influenzae</i> <i>Moraxella catarrhalis</i> <i>Staphylococcus aureus</i> Anaerobes	IV <a href="#">Cefotaxime</a> + IV <a href="#">Metronidazole</a>	IV Cefotaxime: 50mg/kg (max 3g) every 6 hours  Metronidazole: refer to BNFC	2 weeks	Switch to oral <a href="#">Co-amoxiclav</a> once clinically improving, unless patient is penicillin allergic in which case refer to Infectious Diseases/Microbiology for oral stepdown.



## EAR, NOSE AND THROAT INFECTIONS

### CHRONIC MASTOIDITIS

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DURATION OF THERAPY	NOTES
Greater than 1 month	<i>Pseudomonas spp.</i> <i>Escherichia coli</i> Anaerobes <i>Streptococcus spp.</i> <i>Haemophilus influenzae</i> <i>Moraxella catarrhalis</i> <i>Staphylococcus aureus</i>	Dependant on organism isolated, refer to ID/Micro	Minimum of 2 weeks	Following treatment, patients should be observed for a period to monitor for signs of recurrence. If after 3 months post-treatment there are no signs of recurrence then no further treatment will be required.

### TONSILLITIS

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Greater than 1 month	Group A Streptococcus	Oral <a href="#">Amoxicillin</a> Or IV <a href="#">Benzylpenicillin</a>	Refer to BNFc	7 days	Treat patients with antibiotic only if group A streptococci infection suspected or confirmed. A rapid group A Streptococcus test for tonsillitis is available from the lab.  Use <a href="#">Clarithromycin</a> (oral/IV) for 10 days if penicillin allergic.

### PERI-TONSILLAR ABSCESS / RETRO-PHARYNGEAL ABSCESS

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Greater than 1 month	<i>Staphylococcus aureus</i> Group A Streptococcus Anaerobes	IV <a href="#">Co-amoxiclav</a>	Refer to BNFc	7 days	Draining the abscess is the best treatment  Choice in penicillin allergy: <a href="#">Clarithromycin</a> plus <a href="#">Metronidazole</a>

## GASTRO-INTESTINAL INFECTIONS

### CLOSTRIDIODES DIFFICILE INFECTION

Note that Clostridium difficile in stool in children is often not the cause of their illness, other tests may be needed and treatment may not be indicated, refer to Infectious Diseases and / or Consultant Microbiologist for advice if C.difficile is suspected.

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	<i>Clostridium difficile</i>	Oral <a href="#">Metronidazole</a>	Refer to BNFc	7 - 10 days	Oral vancomycin may be used for patients who cannot tolerate or do not respond to metronidazole, but needs to be extemporaneously prepared by the pharmacy.  Relapse is common and should be treated in the same way as the initial episode; it is not believed to be due to antibiotic resistance.

## INTRA-ABDOMINAL INFECTION

### INTRA-ABDOMINAL INFECTION

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Birth to 3 months	Enterobacteriaceae <i>Streptococcus spp.</i>	IV <a href="#">Cefotaxime</a> + IV <a href="#">Metronidazole</a>	Refer to BNFc	5 days and assess response	
Greater than 3 months	Enterobacteriaceae <i>Enterococcus spp.</i> <i>Streptococcus spp.</i> Anaerobes Polymicrobial	IV <a href="#">Piperacillin/Tazobactam</a>  In severe sepsis, consider adding a single dose of IV <a href="#">Gentamicin</a>	Refer to BNFc  IV Gentamicin is indicated for severe sepsis: Single dose of 7mg/kg (max 420mg), if obese use ideal body weight	5 days and assess response	Consider switching to oral <a href="#">Co-amoxiclav</a> when appropriate. For Appendicitis, refer to the <a href="#">Appendicectomy Pathway</a>  Choice in penicillin allergy: Oral <a href="#">Ciprofloxacin</a> plus <a href="#">Metronidazole</a>

### NECROTISING ENTEROCOLITIS

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	Polymicrobial	IV <a href="#">Cefotaxime</a> + IV <a href="#">Metronidazole</a>  In severe sepsis, consider adding a single dose of IV Gentamicin*	Refer to BNFc  IV Gentamicin: Refer to local Aminoglycoside Dosing and Monitoring Guidelines on the intranet	5 days and assess response	*For dosing refer to the appropriate Aminoglycoside Pathway

## RESPIRATORY TRACT INFECTIONS

### COMMUNITY ACQUIRED PNEUMONIA

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Less than 1 month	Treat as per Sepsis (community acquired) guideline on page 8				
Over 1 month	<i>Streptococcus pneumoniae</i> <i>Haemophilus influenzae</i> <i>Mycoplasma pneumoniae</i> <i>Chlamydia pneumoniae</i>	<b>Mild / Moderate disease:</b> Oral <a href="#">Amoxicillin</a> *  <b>Severe disease:</b> Oral <a href="#">Amoxicillin</a> + Oral <a href="#">Clarithromycin</a>	Refer to BNFC	5 days	Oral antibiotics are as effective as IV for the treatment of severe pneumonia. IV antibiotics should only be considered for patients unable to tolerate oral antibiotics.  *When bacterial pneumonia is associated with influenza or measles, <a href="#">Co-amoxiclav</a> is recommended instead of amoxicillin.  In Mild / Moderate disease, <a href="#">Clarithromycin</a> is the second line treatment option in penicillin allergy or if there is no response to amoxicillin or co-amoxiclav after 48 hours.  <a href="#">See BTS Guidelines on PAEDIATRIC COMMUNITY ACQUIRED PNEUMONIA for further information</a>

### ASPIRATION PNEUMONIA

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Less than 1 month	Treat as per Sepsis (community acquired) guideline on page 8				
Over 1 month	<i>Streptococcus pneumoniae</i> <i>Haemophilus influenzae</i> <i>Mycoplasma pneumoniae</i> <i>Chlamydia pneumoniae</i> Anaerobes	IV / oral <a href="#">Co-amoxiclav</a>	Refer to BNFC	5 days	Choice in penicillin allergy: <a href="#">Ciprofloxacin</a> plus <a href="#">Clindamycin</a> . Avoid the use of clindamycin suspension as poor palatability, consider opening clindamycin capsules or metronidazole if a liquid is required.

## RESPIRATORY TRACT INFECTIONS

### HOSPITAL ACQUIRED PNEUMONIA AND COMPLEX CASES (e.g. chronic respiratory conditions, neurodisability etc.)

TIME OF ONSET	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Early Onset (4 days or less hospitalisation)	Treat as per Community Acquired Pneumonia guideline				
Late onset (Greater than 4 days hospitalisation)	Often polymicrobial:  <i>Staphylococcus aureus</i> Enterobacteriaceae <i>Pseudomonas spp</i> Anaerobes  Occasionally: <i>Streptococcus pneumoniae</i> <i>Haemophilus influenzae</i>	IV <a href="#">Piperacillin/Tazobactam</a>	IV <a href="#">Piperacillin/Tazobactam</a> 90mg/kg (max 4.5g) every 6 hours	5 days	Check culture and sensitivity results for oral stepdown. Empirical oral stepdown is <a href="#">Co-amoxiclav</a> unless there is known chronic carriage of <i>Pseudomonas</i> , in which case previous culture and antibiotic sensitivity results should be considered.  If penicillin allergic: IV <a href="#">Ciprofloxacin</a> plus IV <a href="#">Clindamycin</a> . When stepping down to oral avoid the use of clindamycin suspension as poor palatability, consider opening clindamycin capsules or <a href="#">Metronidazole</a> if a liquid is required.

### EMPHYEMA Refer to [Empyema pathway](#)

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	<i>Streptococcus pneumoniae</i> <i>Haemophilus influenzae</i> <i>Mycoplasma pneumoniae</i> <i>Chlamydia pneumoniae</i> Anaerobes	IV <a href="#">Cefuroxime</a> plus IV <a href="#">Clindamycin</a>	IV <a href="#">Cefuroxime</a> : 50mg/kg (max 1.5g) every 6 hours  IV <a href="#">Clindamycin</a> : 10mg/kg (max 1.2g) every 6 hours	14 days	Refer to <a href="#">Empyema pathway</a>  Oral stepdown to <a href="#">Co-amoxiclav</a> unless culture and sensitivities indicate otherwise.  Choice in penicillin allergy; <a href="#">Clarithromycin</a> for IV and for oral stepdown

### INFECTIONS IN CYSTIC FIBROSIS Refer to [Cystic Fibrosis Management of Infection](#) Guideline

### INFLUENZA Refer to [Use of Antivirals for Influenza Clinical Guideline](#)

## SKIN AND SOFT TISSUE INFECTIONS

### BURNS – TREATMENT OF INFECTED BURNS [Refer to Treatment of infections in children in hospital with burns](#) guideline

No. of days after burn	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
5 days or less  Or 6 – 9 days and no recent history of previous antibiotics	<i>Staphylococcus aureus</i> Group A <i>Streptococcus</i> Gram negative bacilli	IV <a href="#">Cefuroxime</a>  If toxic shock; add IV <a href="#">Clindamycin</a>	IV <a href="#">Cefuroxime</a> : 50mg/kg (max 1.5g) every 6 – 8 hrs (refer to BNFC for neonates less than 21 days old)  IV <a href="#">Clindamycin</a> : 10mg/kg (max 1.2g) every 6 hours. Refer to BNFC for neonates.	5 - 10 days	<b>If the patient has been in a hospital in another country in the previous 12 months (Not North America, Northern Europe or Australasia) discuss with Microbiology/ Infectious Diseases.</b>  <a href="#">Refer to Treatment of infections in children in hospital with burns</a> guideline
6 – 9 days and recent history of previous antibiotics  10 days or more	As above plus: MRSA <i>Pseudomonas aeruginosa</i>	IV <a href="#">Vancomycin</a> Plus IV <a href="#">Ceftazidime</a>  If toxic shock; add IV <a href="#">Clindamycin</a>	IV <a href="#">Vancomycin</a> : Refer to local Vancomycin guidelines.  IV <a href="#">Ceftazidime</a> : 50mg/kg (max 2g) every 8 hours. Refer to BNFC for neonates less than 21 days.  IV <a href="#">Clindamycin</a> : 10mg/kg (max 1.2g) every 6 hours. Refer to BNFC for neonates.	5 – 10 days	

### CELLULITIS, ERYSIPELAS, FURUNCLE, SKIN ABSCESS, IMPETIGO

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Less than 1 month	<i>Staphylococcus aureus</i> Group A <i>Streptococcus</i>	<b>Mild:</b> Oral <a href="#">Cefalexin</a>  <b>Severe:</b> IV <a href="#">Cefotaxime</a> + IV <a href="#">Flucloxacillin</a>	Refer to BNFC	7 days	Rationalise antibiotics for severe infections at 48 hours
Greater than 1 month	<i>Staphylococcus aureus</i> Group A <i>Streptococcus</i>	<b>Mild:</b> Oral <a href="#">Cefalexin</a> liquid or Oral <a href="#">Flucloxacillin</a> caps* if able to swallow capsules  <b>If Severe:</b> IV <a href="#">Flucloxacillin</a>	Refer to BNFC	7 Days  Review at 7 days	*Flucloxacillin liquid has a very poor taste  If penicillin allergy/MRSA carrier use <a href="#">Clindamycin</a> . If suspension needed consider oral co-trimoxazole.

## SKIN AND SOFT TISSUE INFECTIONS

### NECROTISING FASCIITIS

The primary treatment of necrotising fasciitis is surgical debridement and urgent surgical opinion should be sought if suspected

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All Ages	<i>Clostridium perfringens</i> Group A <i>Streptococcus</i> <i>Staphylococcus aureus</i> <i>Escherichia coli</i>	IV <a href="#">Cefotaxime</a> + IV <a href="#">Clindamycin</a>	Refer to BNFC and use maximum doses according to age & weight	10 days	<b>Start antibiotics within 1 hour of diagnosis for life threatening infections.</b>

### PRE-SEPTAL CELLULITIS and ORBITAL CELLULITIS

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	<i>Staphylococcus aureus</i> Group A <i>Streptococcus</i> <i>Streptococcus pneumoniae</i> <i>Haemophilus influenzae</i> Anaerobes	IV <a href="#">Cefotaxime</a> * and add IV <a href="#">Metronidazole</a> if there is sinus disease or orbital cellulitis is suspected and refer urgently to ENT.	Refer to BNFC and use maximum doses according to age & weight	7 days for preseptal cellulitis  Longer durations required for orbital cellulitis	Please refer to the <a href="#">Pre-Septal and Orbital Cellulitis Pathway</a>  *If considering OPAT for admission avoidance, consider using once daily ceftriaxone instead of cefotaxime.  <b>Patient should be referred urgently to ENT if orbital cellulitis is suspected</b>  Consider OPAT/switching to oral co-amoxiclav when patient clinically improving.  Refer to Micro/ID if penicillin allergic.

### BITES (HUMAN AND ANIMAL)

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	Polymicrobial: <i>Pasteurella spp.</i> <i>Staphylococcus aureus</i> <i>Streptococcus spp.</i> Anaerobes	Oral / IV <a href="#">Co-amoxiclav</a>	Refer to BNFC	5 days	Check tetanus status, and review need for tetanus booster dose and tetanus immunoglobulin.  If penicillin allergy consider <a href="#">Clarithromycin</a> plus <a href="#">Metronidazole</a>

## SURGICAL SITE INFECTIONS

### INVOLVING HEAD, NECK, TRUNK OR EXTREMITY

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	<i>Staphylococcus aureus</i> Group A <i>Streptococcus pyogenes</i>	<b>Mild</b> (minimal erythema/induration and/or pus) Oral <a href="#">Cefalexin</a>	Refer to BNFc	5 days	If penicillin allergic, use oral or IV <a href="#">Clindamycin</a>  Clindamycin liquid is unpalatable, consider opening capsules.
		<b>Moderate/Severe:</b> IV <a href="#">Cefuroxime</a>		7 days	

### INVOLVING AXILLA, PERINEUM, FEMALE GENITAL TRACT OR GI TRACT

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
All ages	Polymicrobial: <i>Staphylococcus aureus</i> Group A <i>Streptococcus</i> Enterobacteriaceae Anaerobes	<b>Mild:</b> Oral <a href="#">Co-amoxiclav</a>	Refer to BNFc	5 days	If penicillin allergic use ciprofloxacin with <a href="#">Clindamycin</a> oral/IV  Clindamycin liquid unpalatable, consider opening capsules.
		<b>Moderate-Severe:</b> IV <a href="#">Co-amoxiclav</a>		7 days	



## URINARY TRACT INFECTIONS

in patients with presumed normal anatomy

### CYSTITIS / LOWER UTI

Please also refer to [Urinary Tract In-patient Pathway](#) or the [Urinary Tract Out-patient Pathway](#) as appropriate

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Less than 3 months	Treat as per Sepsis (community acquired) guideline on page 8				
More than 3 months	Enterobacteriaceae	Oral <a href="#">Cefalexin</a>	Refer to BNFc	3 days	If oral antibiotic cannot be used, administer IV <a href="#">Cefotaxime</a> . Trimethoprim is an alternative in cephalosporin allergy (unless already on trimethoprim prophylaxis).

### COMPLICATED UTI (UPPER UTI/ UROSEPSIS)

Please also refer to [Urinary Tract In-patient Pathway](#) or the [Urinary Tract Out-patient Pathway](#) as appropriate

AGE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTIC	DOSE	DURATION OF THERAPY	NOTES
Less than 3 months	Treat as per Sepsis (community acquired) guideline on page 8				
More than 3 months	Enterobacteriaceae	IV <a href="#">Cefotaxime</a> Oral stepdown to oral <a href="#">Cefalexin</a>	Refer to BNFc	7-10 days	<a href="#">Ciprofloxacin</a> is an alternative in penicillin/cephalosporin allergy. Always use a different antibiotic for treatment than that used for prophylaxis.

Antibiotic prophylaxis should not routinely be offered for a first time UTI, but may be considered in infant and children with recurrent UTI.  
Always use a different antibiotic for treatment than that used for prophylaxis.

**Part II:**  
**SURGICAL PROPHYLAXIS GUIDELINES**

# GENERAL PRINCIPLES OF SURGICAL PROPHYLAXIS

- **Penicillin allergy** - patients with a history of anaphylaxis, urticaria or rash immediately after penicillin administration should not receive a penicillin or cephalosporin. Discuss alternative antibiotic treatment with Microbiology/ Infectious Diseases team unless an alternative has been suggested in this document.
- **Carriage of Methicillin Resistant Staphylococcus Aureus (MRSA):**  
if the patient is known to have/had MRSA, ADD Teicoplanin to the antibiotic regimen specified in the guidelines, and in elective surgery prescribe topical Mupirocin 2% nasal ointment tds to anterior nares and Octenisan® washes daily for 5 days, with surgery at day 5.
- **Carriage of other multi-resistant organisms:** use standard antimicrobial prophylaxis recommended in the guidelines
- **Antibiotics for surgical prophylaxis should be administered on induction**
- **If patient is already receiving treatment antibiotics** but has not received doses of antibiotics in the previous hour; beta-lactams such as cefotaxime, cefuroxime, co-amoxiclav and piperacillin/tazobactam can be re-dosed on induction due to short half-life (this does not apply to ciprofloxacin, metronidazole, clindamycin, gentamicin, metronidazole or teicoplanin).
- **Major blood loss (>20 ml/kg):** additional dosage of prophylactic antibiotic should be considered after fluid replacement.
- **Prolonged surgery:** additional doses of antibiotic should be considered as indicated in the tables on the next page.
- **If an antibiotic is to be continued post-op:** the first post-op dose should be given after a "normal dosing interval" from the last intra-operative dose (e.g. antibiotic with "normal dosing frequency" of 8 hours, given on induction at 9am, re-dosed at 12noon during prolonged surgery, therefore first post-op dose due at 8pm).
- **All prescriptions for surgical prophylaxis should have a stop date** when prescribed.
- **Prophylaxis against infective endocarditis is NOT recommended in the following circumstances:**
  - For patients undergoing dental procedures
  - For patients undergoing non-dental procedures at the following sites: upper and lower GI tract; GU tract (this includes urological, gynaecological and obstetric procedures and childbirth); upper and lower respiratory tract (this includes ear, nose and throat procedures and bronchoscopy)
- **Prophylaxis against infective endocarditis IS recommended in the following circumstances:**
  - If a patient at risk of infective endocarditis is having a GI or GU procedure at a site where there is suspected infection; give a single dose of Teicoplanin at induction AS WELL AS the usual antibiotic prophylaxis for the surgery

## ANTIBIOTIC DOSES AND REDOSING ADVICE FOR SURGICAL PROPHYLAXIS

Antibiotic doses assume children have normal renal function. Doses may require modification in renal impairment. Consult the BNF for Children for further details on dosing.

### Intraoperative dosing table for Neonates

ANTIBIOTIC	PRE AND INTRAOPERATIVE DOSES FOR NEONATES	ADMINISTRATION	INTRAOPERATIVE REDOSING
<a href="#">Cefotaxime</a>	50mg/kg	Slow IV bolus injection	N / A
<a href="#">Cefuroxime</a>	50mg/kg	Slow IV bolus injection	N / A
<a href="#">Clindamycin</a>	5mg/kg	IV infusion over 15 mins	Every 8 hours
<a href="#">Co-amoxiclav</a>	30mg/kg	Slow IV bolus injection	N / A
<a href="#">Gentamicin</a>	5mg/kg If continuing post-op, check level after 24hrs to ensure <1mg/L, then refer to aminoglycoside pathway for dosing advice	Slow IV bolus injection	N / A
<a href="#">Metronidazole</a>	Neonate with gestational age under 40wks: 10mg/kg Neonates with gestational age 40wks and above: 20 - 30mg/kg	IV infusion over 20 mins	N / A
<a href="#">Teicoplanin</a>	16mg/kg	IV infusion over 30 mins	N / A

### Intraoperative dosing table for children over 44 weeks corrected gestational age

ANTIBIOTIC	PRE AND INTRAOPERATIVE DOSE FOR CHILDREN OVER 44 WEEKS CORRECTED GESTATIONAL AGE	ADMINISTRATION	INTRAOPERATIVE REDOSING
<a href="#">Cefuroxime</a>	50mg/kg (max 1500mg)	Slow IV bolus injection	Every 3 hours
<a href="#">Ciprofloxacin</a>	10mg/kg (max 400mg)	IV infusion over 60mins	N/A
<a href="#">Co-amoxiclav</a>	30mg/kg (max 1200mg)	Slow IV bolus injection	Every 3 hours
<a href="#">Clindamycin</a>	5mg/kg	IV infusion over 15 mins	Every 6 hours
<a href="#">Gentamicin</a>	2.5mg/kg If continuing post-op, check level after 8hrs to ensure <1mg/L, then refer to aminoglycoside pathway for dosing advice	Slow IV bolus injection	N / A
<a href="#">Metronidazole</a>	Age 1 month – 12 years: 30mg/kg (max 500mg) Age 12 – 18 years: 500mg	IV infusion over 20 mins	N / A
<a href="#">Piperacillin/ Tazobactam</a>	Age 1 month – 2years: 90mg/kg Age over 2 years: 112.5mg/kg (max 4.5gram)	Slow IV bolus injection	Every 3 hours
<a href="#">Teicoplanin</a>	1 - 2 months: 16mg/kg	IV infusion over 30 minutes	N / A
	Older than 2 months: 10mg/kg (max 800mg)	Slow IV bolus injection	

## CARDIAC SURGICAL PROPHYLAXIS GUIDELINES

PROCEDURE	LIKELY PATHOGENS	CHOICE OF ANTIBIOTICS	DURATION OF POST-OP THERAPY	DOSING/NOTES
Cardiac Surgery (7 days old or less)	<i>Staphylococcus aureus</i>	IV <a href="#">Cefuroxime</a>	24 hours (2 doses)  (unless chest open)	Give 50mg/kg at induction  50mg/kg/dose every 12 hours (first PICU dose to be given 12 hours after last theatre dose)
Cardiac surgery (Greater than 7 days old)	<i>Staphylococcus aureus</i>	IV <a href="#">Cefuroxime</a>	24 hours (3 doses)  (unless chest open)	Give 50mg/kg (max 1.5g) at induction  50mg/kg/dose (max 1.5g) every 8 hours (first PICU dose to be given 8 hours after last theatre dose)
<b>If chest open (with or without ECMO) continue antibiotics until chest closure, refer to guidance below for chest closure.</b>				
Chest Closure or chest exploration on PICU	<i>Staphylococcus aureus</i>	IV <a href="#">Cefuroxime</a>	Dose pre and post procedure	Give 50mg/kg/dose (maximum 1.5g) 30 minutes prior to procedure (give only if cefuroxime dose administered greater than 3 hours previously)  Second dose of 50mg/kg (maximum 1.5g) to be administered: <ul style="list-style-type: none"> <li>• 12 hours later if neonate 0- 7days</li> <li>• 8 hours later if greater than 7 days</li> </ul>

In the case of **penicillin / cephalosporin allergy** use IV teicoplanin plus IV gentamicin as an alternative to cefuroxime (see page 33)

## CARDIAC SURGICAL PROPHYLAXIS GUIDELINES (continued)

For teicoplanin/gentamicin – follow dosing regimen below.

**If teicoplanin and/or gentamicin are used - do not re-dose** every 3 hours in prolonged surgery or give doses pre/post chest closure/exploration.

AGE	CHOICE OF ANTIBIOTICS	DURATION OF POST-OP THERAPY	DOSING
All infants less than 44 weeks corrected gestational age	IV <a href="#">Teicoplanin</a> plus IV <a href="#">Gentamicin</a>	24 hours (unless chest Open)	<p><a href="#">Teicoplanin</a>: 16mg/kg on induction followed by ONE dose of 8mg/kg 24 hours later (administer as a 30 minute infusion).</p> <p style="text-align: center;"><b>plus</b></p> <p>Gentamicin: 4mg/kg on induction, check pre dose level after 22 – 24 hours, ensure level is less than 2mg/L, before giving ONE more dose of 4mg/kg.</p>
			<p><b>If chest open</b> continue up to and including day of chest closure with:</p> <p><a href="#">Teicoplanin</a>: 16mg/kg on induction followed by 8mg/kg every 24 hours thereafter (administer as a 30 minute infusion)</p> <p style="text-align: center;"><b>plus</b></p> <p>Gentamicin: 4mg/kg on induction, check pre dose level after 22 – 24 hours, ensure level is less than 2mg/L, before continuing with 4mg/kg every 24 hours (also check pre dose and 1 hour post levels at 3<sup>rd</sup> dose, and every 2 – 3 days thereafter, or more frequently if clinically indicated e.g. in patients with renal dysfunction).</p>
Greater than 44 weeks corrected gestational age to 18 years	IV <a href="#">Teicoplanin</a> plus IV <a href="#">Gentamicin</a>	24 hours (unless chest Open)	<p><a href="#">Teicoplanin</a>: 1 – 2 months: 16mg/kg on induction followed by 8mg/kg every 24 hours thereafter</p> <p>Older than 2 months: 10mg/kg (max 800mg) on induction followed by 10mg/kg (max 800mg) every 12 hours for a further TWO doses</p> <p style="text-align: center;"><b>plus</b></p> <p>Gentamicin: 3mg/kg on induction, check pre dose level 12 hours later, ensure level less than 1mg/L before giving 7mg/kg as a 20 minute infusion for ONE dose only.</p>
			<p><b>If chest open</b> continue up to and including day of chest closure with:</p> <p><a href="#">Teicoplanin</a>: Dose as above.</p> <p style="text-align: center;"><b>plus</b></p> <p>Gentamicin: 3mg/kg on induction, check pre dose level 12 hours later, ensure level less than 1mg/L before starting 7mg/kg as a 20 minute infusion every 24 hours as per Trust <a href="#">Aminoglycoside Pathway for children over 44 weeks corrected gestation age</a>.</p>

## CARDIAC PACEMAKER INSERTION

This guideline refers to: endo-cardiac and epi-cardiac pace-maker implantations, new implantations, battery replacements, with or without lead(s) replacements

AGE	LIKELY PATHOGENS	CHOICE OF ANTIBIOTICS	DURATION OF THERAPY	NOTES
Gestational age: less than 32 weeks	<i>Staphylococcus aureus</i>  Coagulase - negative <i>Staphylococcus</i>	IV <a href="#">Teicoplanin</a>  plus  IV <a href="#">Gentamicin</a>	<a href="#">Teicoplanin</a> : 16mg/kg on induction, followed by 8mg/kg after 24hrs plus Gentamicin: 4mg/kg on induction only	Disinfect the skin by swabbing with chlorhexidine alcohol solution 3 times.  If teicoplanin or gentamicin are contra-indicated or unavailable, IV cefuroxime can be used. See CHOICE OF ANTIBIOTIC below for dosage.
Gestational age: 32 weeks to 44 weeks	<i>Staphylococcus aureus</i>  Coagulase - negative <i>Staphylococcus</i>	IV <a href="#">Teicoplanin</a>  plus  IV <a href="#">Gentamicin</a>	<a href="#">Teicoplanin</a> : 16mg/kg on induction, followed by 8mg/kg after 24hrs plus Gentamicin: 4mg/kg on induction followed by 4mg/kg after 24hrs	Disinfect the skin by swabbing with chlorhexidine alcohol solution 3 times.  If teicoplanin or gentamicin are contra-indicated or unavailable, IV cefuroxime can be used. See CHOICE OF ANTIBIOTIC below for dosage.
1 month to 18 years	<i>Staphylococcus aureus</i>  Coagulase - negative <i>Staphylococcus</i>	IV <a href="#">Teicoplanin</a>  plus  IV <a href="#">Gentamicin</a>	<a href="#">Teicoplanin</a> : See notes  plus  Gentamicin: 3mg/kg on induction followed by 3mg/kg after 12hrs and 24hrs	Disinfect the skin by swabbing with chlorhexidine alcohol solution 3 times.  <a href="#">Teicoplanin</a> : 1 – 2months: 16mg/kg on induction, followed by 8mg/kg after 24hrs Older than 2 months: 10mg/kg (max 800mg) on induction followed by 10mg/kg (max 800mg) every 12 hours for a further TWO doses  If teicoplanin or gentamicin are contra-indicated or unavailable, IV cefuroxime can be used. See CHOICE OF ANTIBIOTIC below for dosage.

## CLEFT LIP AND PALATE SURGICAL PROPHYLAXIS

PROCEDURE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTICS	DURATION OF THERAPY	NOTES / DOSING INFORMATION
<ul style="list-style-type: none"> <li>• Primary Lip &amp; Palate Repairs</li> <li>• Secondary Lip &amp; Palate Repairs (Revisions)</li> </ul>	<i>Staphylococcus aureus</i> <i>Streptococcus spp</i>	IV <a href="#">Cefuroxime</a>	Single Dose	
<ul style="list-style-type: none"> <li>• Bone Grafting Procedures</li> </ul>	<i>Staphylococcus aureus</i> <i>Streptococcus spp</i>	IV <a href="#">Cefuroxime</a>	24 hours	Neonates: 0-7 days 50mg/kg, 12 hourly for total of 2 doses  Neonates less than 7 days and all other ages: 50mg/kg, 8 hourly for a total of 3 doses (maximum 1.5g/dose)

In cases where there is **penicillin / cephalosporin allergy or anaphylaxis to penicillin** use IV [Teicoplanin](#) as an alternative to cefuroxime



## EAR, NOSE AND THROAT SURGICAL PROPHYLAXIS

PROCEDURE	LIKELY ORGANISM	CHOICE OF ANTIBIOTICS	DURATION	NOTES
Clean head & neck surgery (Incl. radical neck dissection)	Prophylaxis not recommended			
Contaminated/ clean-contaminated head & neck surgery	<i>Staphylococcus aureus</i> <i>Streptococcus spp.</i> Anaerobes	IV <a href="#">Cefuroxime</a> +/- IV <a href="#">Metronidazole</a>	Single Dose	
Tracheostomy	Prophylaxis not recommended			
Grommet insertion With dry ear	Prophylaxis not recommended			
Grommet insertion with infected ear	<i>Streptococcus pneumoniae</i> <i>Haemophilus influenzae</i> <i>Moraxella catarrhalis</i>	Ciprofloxacin 0.3% ear drops	x 5 days	
Adenoidectomy • Suction diathermy • Coblation • Traditional (curette)	Prophylaxis not recommended			
Tonsillectomy • Traditional • Coblation	Prophylaxis not recommended			

In cases where there is **penicillin / cephalosporin allergy** use IV [Teicoplanin](#) as an alternative to cefuroxime

## EAR, NOSE AND THROAT SURGICAL PROPHYLAXIS (continued)

PROCEDURE	LIKELY ORGANISM	CHOICE OF ANTIBIOTICS	DURATION	NOTES
Mastoidectomy for acute mastoiditis	<i>Streptococcus pneumoniae</i> <i>Haemophilus influenzae</i> <i>Moraxella catarrhalis</i> Group A <i>Streptococcus</i> <i>Staphylococcus aureus</i>	IV <a href="#">Cefuroxime</a>  +/- Ciprofloxacin 0.3% ear drops	Single dose	Refer to acute mastoiditis treatment guidelines
Mastoidectomy +/- Choleasteatoma	Prophylaxis not recommended			
Foreign body removal	Prophylaxis not recommended			
Nose or sinus surgery • Reduction of nasal fracture • Septoplasty • Septorhinoplasty • Intranasal polypectomy • Submucosal Diathermy to the Inferior Turbinates (SMDIT) • Endoscopic sinus surgery	Prophylaxis not recommended			
Epistaxis Anterior – Merocel	<i>Staphylococcus aureus</i> <i>Streptococcus spp</i>	IV <a href="#">Co-amoxiclav</a> If packing left greater than 24hours	Until gauze removed	
Epistaxis Posterior – ballon/foleys		No prophylaxis		

In cases where there is **penicillin / cephalosporin allergy** use IV [Teicoplanin](#) as an alternative to cefuroxime

## GASTRO-INTESTINAL SURGICAL PROPHYLAXIS

PROCEDURE	POTENTIAL PATHOGENS	ANTIBIOTICS	DURATION	NOTES
Appendectomy	Enterobacteriaceae <i>Staphylococcus aureus</i> Anaerobes	IV <a href="#">Piperacillin/ Tazobactam</a>	Refer to <a href="#">Appendectomy pathway</a>	Refer to <a href="#">Appendectomy pathway</a> regarding treatment antibiotics
Clean and Clean-contaminated	Enterobacteriaceae <i>Staphylococcus aureus</i> Anaerobes	IV <a href="#">Co-amoxiclav</a>	Single dose	
Contaminated	Enterobacteriaceae <i>Staphylococcus aureus</i> Anaerobes	IV <a href="#">Co-amoxiclav</a>	48 hrs	Consider for heavily contaminated surgery involving lower GI tract.
Therapeutic endoscopy	Enterobacteriaceae	IV <a href="#">Co-amoxiclav</a>	Single dose	Refers to additional therapy procedure performed besides the routine endoscopy. Examples include insertion of PEG and removal of polyps.
Diagnostic endoscopy	Surgical prophylaxis not recommended			

In the case of **penicillin allergy** use IV [Clindamycin](#) plus IV [Gentamicin](#)

## NEUROSURGERY AND CRANIOFACIAL SURGICAL PROPHYLAXIS

PROCEDURE	LIKELY CAUSATIVE ORGANISM	CHOICE OF ANTIBIOTICS	DURATION OF THERAPY	NOTES
Clean non-implant surgery and clean implant surgery	<i>Staphylococcus aureus</i>	IV <a href="#">Cefuroxime</a>	Single dose	
Clean - contaminated procedures	<i>Staphylococcus aureus</i> <i>Streptococcus pneumoniae</i> Anaerobes	IV <a href="#">Cefuroxime</a> plus IV <a href="#">Metronidazole</a>	Single dose of each	
CSF shunt surgery	<i>Staphylococcus aureus</i>	IV <a href="#">Cefuroxime</a> plus INTRAVENTRICULAR Vancomycin	Single dose of each at induction	
Spinal surgery	<i>Staphylococcus aureus</i>	IV <a href="#">Cefuroxime</a>	Single dose	
Craniofacial procedures	<i>Staphylococcus aureus</i>	IV <a href="#">Cefuroxime</a> + / - IV <a href="#">Metronidazole</a>	24 hours	Add metronidazole for procedures that cross the naso or oropharynx

In cases where there is **penicillin / cephalosporin allergy** use IV [Teicoplanin](#) as an alternative to cefuroxime

### **INTRAVENTRICULAR DRUG DOSES**

#### **VANCOMYCIN (prepared doses available from pharmacy):**

- Neonate: 10mg once every 24 hours
- Child 1 month-18 years: 10mg once every 24 hours

Note: For all children, reduce to 5mg daily if ventricular size reduced or increase to 15-20mg once daily if ventricular size increased.

## ORTHOPAEDIC AND SPINAL SURGICAL PROPHYLAXIS

CONDITION	LIKELY PATHOGENS	ANTIBIOTICS	DURATION	COMMENTS
Clean orthopaedic surgery <u>without</u> insertion of implants	Prophylaxis not required			
Clean orthopaedic surgery <u>with</u> insertion of implants	<i>Staphylococcus aureus</i>	IV <a href="#">Cefuroxime</a>	Single dose	
Contaminated Orthopaedic surgery	<i>Staphylococcus aureus</i> Gram negative bacilli	IV <a href="#">Cefuroxime</a>	Up to 3 days	<p>Prompt initiation of antibiotics on arrival in A&amp;E is a priority, which should be continued until soft tissue closure or for a maximum of 3 days, whichever is shorter.</p> <p>A single dose of IV <a href="#">Teicoplanin</a> 10mg/kg (max 800mg) and a single dose of IV <a href="#">Gentamicin</a> to be given at wound closure.</p> <p>Assess need for tetanus immunisation.</p>
Spinal Surgery	<i>Staphylococcus aureus</i>	IV <a href="#">Cefuroxime</a>	48 hours	Refer to spinal surgery pathway

In cases where there is **penicillin / cephalosporin allergy** use IV [Teicoplanin](#) (plus IV [Gentamicin](#) for contaminated surgery) as an alternative to cefuroxime

## URO-GENITAL SURGICAL PROPHYLAXIS

PROCEDURE	LIKELY PATHOGENS	ANTIBIOTIC	DURATION	NOTES
Circumcision	Prophylaxis not recommended			
Cystoscopy	Enterobacteriaceae	IV <a href="#">Co-amoxiclav</a>	Single dose	
Hypospadias repair	Enterobacteriaceae	IV <a href="#">Co-amoxiclav</a>	Single dose	If urinary catheter left in situ then administer oral Trimethoprim until catheter is removed
Hydrocoele / hernia repair	Prophylaxis not recommended			
Shock wave lithotripsy	Enterobacteriaceae	IV <a href="#">Co-amoxiclav</a>	Single dose	
Endoscopic ureteric stone fragmentation/removal	Enterobacteriaceae	IV <a href="#">Co-amoxiclav</a>	Single dose	
Nephrectomy	Enterobacteriaceae	IV <a href="#">Co-amoxiclav</a>	Single dose	Prophylaxis not recommended unless patient has recurrent urinary tract infections
Pyeloplasty (with / without stent)	Enterobacteriaceae	IV <a href="#">Co-amoxiclav</a>	Single dose	
Reconstructive surgery (involving bowel)	Enterobacteriaceae Anaerobes	IV <a href="#">Co-amoxiclav</a>	Single dose	
Surgery for vesicoureteric reflux (endoscopic or open)	Enterobacteriaceae	IV <a href="#">Co-amoxiclav</a>	Single dose	
Urethroplasty	Enterobacteriaceae	IV <a href="#">Co-amoxiclav</a>	Single dose	
MCUG (Micturating cystourethrogram)	Enterobacteriaceae	Oral <a href="#">Trimethoprim</a>	3 days*	*To be started 24 hours before the procedure

In cases where there is **penicillin / cephalosporin allergy** use IV [Teicoplanin](#) plus IV [Gentamicin](#) as an alternative to co-amoxiclav

# **Appendix I: RESTRICTED ANTIMICROBIALS**

## RESTRICTED ANTIMICROBIALS

The use of the antimicrobials in the table below should be restricted in order to minimise the development of antimicrobial resistance. Only Consultants from the specialties indicated in the table can approve the use of these antimicrobials and their recommendation must be documented in the case notes along with the following information: a) Indication b) Evidence of an assessment of severity (may include temperature, heart rate, respiratory rate, blood pressure, white cell count, CRP) c) Evidence of appropriate cultures being taken (preferably before starting antimicrobials).

Antimicrobial	Infectious Diseases/ Microbiology	Oncology (according to guidelines)	Respiratory (according to guidelines)	PICU
Liposomal Amphotericin	✓	✓		
Caspofungin	✓			
IV Colistin	✓			
Daptomycin	✓			
Ertapenem	✓			
Fosfomycin	✓			
Levofloxacin	✓			
Linezolid	✓			
Micafungin	✓			
Meropenem	✓	✓	✓	✓
Temocillin	✓			
Tigecycline	✓			
Pivmecillinam	✓			
Voriconazole	✓	✓		



## RESTRICTED ANTIMICROBIALS DOSE INFORMATION

Doses for the following restricted antimicrobials are not listed in the BNFc or the manufacturer's summary of product characteristics. Instead we have based our dose recommendations on the limited evidence available.

RESTRICTED ANTIMICROBIAL	RECOMMENDED DOSE	NOTES
IV Daptomycin	<u>IV bolus or short infusion</u> Less than 3 months: 6mg/kg/dose every 12 hours 3 months – 2 years: 10mg/kg/dose every 24 hours 2 – 6 years: 9mg/kg every 24 hours 7 – 11 years: 7mg/kg every 24 hours 12 – 17 years: 5mg/kg every 24 hours (consider using adult dose for infective endocarditis: 6mg/kg daily)	Measure baseline serum creatine kinase and monitor weekly thereafter due to risk of myopathy.  Pre-dose and 1-hour post-dose levels are required for patients with renal impairment or creatine kinase elevation. Measure levels around the 3rd or 4th dose and send to Bristol Antimicrobial Reference Laboratory via the Biochemistry department. Target predose level is 5 – 20mg/L. Bristol will advise an appropriate range for 1-hour post dose levels.
Oral Fosfomycin Calcium 250mg/5ml liquid	Preterm neonates and children <1 year: 150-300mg every 8 hours Children greater than 1 year: 250-500mg every 8 hours Adults: 500mg-1g every 8 hours	
Oral Fosfomycin trometamol 3 gram sachets	Age less than 1 year: Uncomplicated cystitis: 1g single dose orally  Age 1-12 years: Uncomplicated cystitis: 2g single dose orally  Greater than 12 years: Uncomplicated cystitis: 3g single dose orally.	If this product is used for recurrent cystitis, consider repeating the dose at 3 day intervals.
IV Levofloxacin	<u>IV Infusion</u> Age 6 months-5 years: 10mg/kg/dose twice daily  Age greater than 5 years: 10mg/kg once daily (maximum single dose is 500mg)  Adults: 500mg once or twice daily.	
Oral Levofloxacin	Age 6 months-5 years: 10mg/kg/dose twice daily  Age greater than 5 years: 10mg/kg once daily (maximum single dose is 500mg)  Adults: 500mg once or twice daily.	Available as 250mg tablets.  Pharmacy can also formulate a 250mg/5ml liquid if required.
IV Micafungin	<u>IV infusion</u> Age up to 4 months (including neonates): 4 – 10mg/kg once daily*  Age greater than 4 months: Dose as per BNFc	*If central nervous system (CNS) infection is suspected 10 mg/kg dose should be used due to the dose-dependent penetration of micafungin into the CNS. The safety and efficacy in children less than 4 months of age on doses of 4 and 10 mg/kg for the treatment of invasive candidiasis with CNS involvement has not been established in clinical studies.
Oral Pivmecillinam 200mg tablets	Dose as per BNFc but consider that this product is only available as a 200mg tablet, which can be cut into 100mg portions and crushed before adding to a small amount of food or administration via an enteral feeding tube.	
IV Temocillin	IV bolus or short infusion Age 6 months and above: 25mg/kg (max 2g) every 12 hrs	
IV Tigecycline	IV infusion Age less than 8yrs: NOT TO BE USED Age 8 to less than 12yrs: 1.2mg/kg (max 50mg) every 12hrs Age 12-18 years: 50mg every 12 hours	

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<b>Antimicrobial Prescribing Guidelines</b>	
Version:	6
Ratified by:	Clinical Development Evaluation Group
Date ratified:	16 <sup>th</sup> April 2021
Name of originator/author:	Kelly McGrail (Antimicrobial Pharmacist)
Name of responsible committee:	Antimicrobial Stewardship Group (ASG)
Name of executive sponsor:	N/A
Key search words:	ABSCESS, Antibiotic, Antibiotics, Antimicrobial, Antimicrobials, Bite, Bites, Burn, Burns, Cellulitis, Cystitis, DENTAL ABSCESS, Infective endocarditis, ENDOCARDITIS, Empyema, Infection, Infections, Empirical, Epiglottitis, LYMPHADENITIS, MASTOIDITIS, NECROTISING ENTEROCOLITIS, NECROTISING FASCIITIS, Surgical Prophylaxis, Surgical site infection, Otitis media, Pre-septal cellulitis, Orbital cellulitis, Prophylaxis, PERI-TONSILLAR ABSCESS, Pneumonia, pyelonephritis, RETRO-PHARYNGEAL ABSCESS, CLOSTRIDIUM DIFFICILE, Restricted, SALIVARY GLAND INFECTION, Sepsis, Septic, Septic arthritis, Septicaemia, Sinusitis, TONSILLITIS, Meningitis, Osteomyelitis, UTI, Urinary tract infection
Date issued:	16 <sup>th</sup> April 2021
Review date:	April 2024

<b>Version Control Table</b>				
Version	Date	Author(s)	Status	Comment(s)
6	April 21	K McGrail	Current	Inclusion of High Dose Antibiotic Table
5	May 18	A Taylor, D Porter, A Riordan	Archived	
4	Nov 17	A Taylor	Archived	Reverted back to Aug 17 version
3	Oct 17	A Taylor, D Porter	Archived	
2	Aug 17	D Sharpe, S Paulus, A Riordan, D Porter	Archived	
1	Jun 17	D Sharpe, S Paulus, A Riordan, D Porter	Archived	To improve access to local antimicrobial prescribing guidelines the following existing docs have been combined into a single file: the empirical treatment guidelines, cardiac surgical prophylaxis guidelines, cardiac pacemaker insertion prophylaxis guidelines, cleft lip and palate surgical prophylaxis, ear, nose and throat surgical prophylaxis, gastro-intestinal surgical prophylaxis, neurosurgery and craniofacial surgical prophylaxis, orthopaedic and spinal procedures surgical prophylaxis, uro-genital surgical prophylaxis and the restricted antimicrobials list.

<b>Review and Revision(s) Log</b>			
<i>Record of revision(s) made to guidelines since Version 1</i>			
Section Number	Page Number	Revision(s) made	Reason for revision(s)
Part I	7	Inclusion of High Dose Antibiotic Table (April 2021)	To provide dosing advice for specific infections as per the most recent EUCAST guidance.
	Mar 18	To Sepsis (Community/Hospital Acquired) To Sinusitis  Necrotising enterocolitis Teicoplanin dosing cap increased to 800mg (max dose that can be given by IV bolus) Restricted Antimicrobial list	In line with current practice In line with decision to follow NICE guidance To reflect current practice