Doncaster and Bassetlaw Teaching Hospitals
NHS Foundation Trust

INFECTIONS IN CHILDREN-ANTIMICROBIAL MANAGEMENT

Name & Title Of Authors:	Dr K Agwuh, Consultant Microbiologist Dr N Rao,Consultant Paediatrician Dr V Desai Consultant Paediatrician
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CONTENTS

1. Introduction

- Dosing information is available in the most recent edition of **BNF for Children**
  NOTE: IN THE CASE OF SEVERE INFECTIONS USE THE HIGHEST RECOMMENDED DOSE

- Unless otherwise stated, the duration of treatment for most of the uncomplicated infections with no serious underlying disease is 5-7 days. In serious infections, the duration will be determined by the patient's condition and response to treatment

- Empiric antimicrobial treatment for conditions not listed below should be discussed with the microbiologist

- For more detailed information regarding causative organisms and microbiological investigations, please refer to the equivalent Adult Antimicrobial guidelines

- This guidance does not cover antibiotic treatment of Haemato-oncology patients, patients with Tuberculosis or Cystic fibrosis and neonates. Please refer to separate guidelines

- All antimicrobial treatments should be revised based on clinical response or as soon as culture results are available.

- Please ensure that vital information about the patient (eg clinical findings, radiological/biochemical results, antibiotic history etc) is available to hand before contacting microbiologists

2. Gastrointestinal Infections

<table>
<tr><th colspan="2">Type of Infection</th><th>Antibacterial agent</th><th>Oral switch when clinically indicated</th><th>Comments</th></tr>
<tr><td rowspan="3">Peritonitis</td><td>First Line</td><td>IV Co-amoxiclav</td><td>Co-amoxiclav</td><td rowspan="3">Length of treatment depends on clinical condition but generally 5-7 days.

Antibiotics should be modified based on sensitivity results.</td></tr>
<tr><td>Second line OR
Non life-thereatening penicillin allergy</td><td>IV Cefuroxime
AND IV Metronidazole</td><td>Cefalexin AND
Metronidazole</td></tr>
<tr><td>Life-threatening penicillin allergy</td><td>IV/oral Ciprofloxacin
AND IV/oral Metronidazole</td><td>Ciprofloxacin
AND Metronidazole</td></tr>
<tr><td colspan="2">Salmonellosis and Shigellosis</td><td colspan="2" rowspan="2">Only treat with antibiotics in the following:
Salmonella
• typhoid fever or invasive salmonellosis
• immunosuppression
• cardiac valves or endovascular abnormalities
• <3 months of age
• Haemoglobinopathies
• Chronic GI illnesses
Campylobacter or Shigella
• severe symptoms
• systemically unwell
• immunosuppression or prolonged symptoms of > 1 week(for Campylobacter)
Non-invasive disease is usually self- limiting</td><td rowspan="2">If antibiotic treatment is required, consult Microbiologist

<u>Notifiable disease</u></td></tr>
<tr><td colspan="2">Campylobacter enteritis</td></tr>
<tr><td colspan="2">Escherichia coli 0157</td><td colspan="2">Do not treat with antibiotics, as this may lead to an increase in toxin release.</td><td>May lead to haemolytic-uraemic syndrome (HUS). This is a <u>Notifiable disease</u></td></tr>
<tr><td colspan="2">C. difficile infection</td><td colspan="2">Refer to the trust C. difficile policy PAT/IC 26. Use BNF for children for dosage information.</td><td>Presence of Clostridium difficile toxin is not usually clinically significant in children under 2 years old.</td></tr>
</table>

3. Upper Respiratory Tract Infections

<table>
<tr><th colspan="2">Type of Infection</th><th>Antibacterial agent</th><th>If MRSA positive <u>add:</u></th><th>Oral switch</th><th>Comments</th></tr>
<tr><td rowspan="2">Acute Epiglottitis</td><td>First Line</td><td>IV Cefotaxime
OR IV Ceftriaxone</td><td rowspan="2">Oral/IV Clarithromycin
(if susceptible)

OR

Oral/IV Linezolid
(if clarithromycin resistant)</td><td rowspan="2">Full course IV preferable

If oral switch possible:
Co-amoxiclav
OR Co-trimoxazole (if Penicillin allergic)
AND oral MRSA cover where indicated.</td><td rowspan="2">Secure airway

Length of treatment depends on clinical condition but minimum 10 days.

Base oral switch on sensitivity results where available.</td></tr>
<tr><td>Life-threatening penicillin/ cephalosporin allergy</td><td>IV Co-trimoxazole</td></tr>
<tr><td rowspan="5">Acute Otitis Media</td><td>Viral</td><td colspan="4">Viruses are common causes for which antibiotics are not indicated</td></tr>
<tr><td rowspan="2">First Line</td><td>Oral/IV Amoxicillin</td><td rowspan="3">Oral/IV clarithromycin
(if susceptible and not already on)

OR

Oral Linezolid
(unless susceptible to clarithromycin/azithromycin and patient is on this regime)</td><td rowspan="3">As for first/second line oral choice +/- MRSA cover where indicated</td><td rowspan="4">Antibiotics other than Azithromycin
● Treat for 7 days if ≥ 2yrs old
● Treat for 10 days if <2yrs and / or has old/recurrent disease

Azithromycin Used
● Treat for 3 days</td></tr>
<tr><td>Recurrent infection or failure of 48hrs of Amoxicillin:
Oral/IV Co-amoxiclav</td></tr>
<tr><td rowspan="2">Second line/penicillin allergy</td><td>Oral/ IV Clarithromycin OR Oral Azithromycin (>6 months of age)</td></tr>
<tr><td>Recurrent infection or failure of 48hrs second line: IV Cefuroxime or oral Cefaclor</td><td colspan="2"></td></tr>
<tr><td>Life-threatening penicillin allergy or cephalosporin allergy AND 2nd line contra-indicated</td><td colspan="3">Discuss with the Microbiologist</td></tr>
</table>

<table>
<tr><td rowspan="3">Sinusitis</td><td rowspan="2">First Line</td><td>Oral or IV Amoxicillin</td><td rowspan="3">Oral/IV clarithromycin
(if susceptible and not already on)

OR

Oral/IV Linezolid
(unless susceptible to clarithromycin/azithromycin and patient is on this regime)</td><td rowspan="3">As for first/second line oral choice +/- MRSA cover where indicated</td><td rowspan="3">For Azithromycin, treat for 3 days.

Otherwise treat for 7 days</td></tr>
<tr><td>Failure of 48hrs of Amoxicillin:
Oral/IV Co-amoxiclav</td></tr>
<tr><td>Second line/penicillin allergy</td><td>Oral/IV Clarithromycin OR Oral Azithromycin (>6 months of age)

Failure of 48hrs second line: IV Cefuroxime or oral Cefaclor</td></tr>
<tr><td rowspan="2">Tonsillitis/ Pharyngitis</td><td>First Line</td><td>Oral Phenoxymethylpenicillin (Penicillin V)
OR IV Benzylpenicillin
(if cannot take orally)</td><td rowspan="2">Oral/IV Clarithromycin
(if susceptible and not already on)

OR

Ora/IV Linezolid
(unless susceptible to clarithromycin/azithromycin and patient is on this regime)</td><td rowspan="2"></td><td rowspan="2">For Azithromycin, treat for 3 days.

Otherwise, treat for 10 days</td></tr>
<tr><td>Second line/penicillin allergy</td><td>Oral/IV Clarithromycin OR Oral Azithromycin (>6 months of age)</td></tr>
<tr><td rowspan="2">Pertussis</td><td>First Line</td><td colspan="2">IV or Oral Clarithromycin OR Oral Azithromycin (>6 months of age)</td><td>Clarithromycin OR Azithromycin</td><td rowspan="2">● Azithromycin: treat for 3 days. Otherwise treat for 7 days
● Commence treatment within 21 days of onset. Notifiable disease</td></tr>
<tr><td>Second line/penicillin allergy</td><td colspan="2">IV or oral Co-trimoxazole</td><td>Co-trimoxazole</td></tr>
</table>

4. Lower Respiratory Tract Infections

<table>
<tr><th colspan="3">Type of Infection</th><th>Antibacterial agent</th><th>If MRSA positive add:</th><th>Oral switch</th><th>Comments</th></tr>
<tr><td rowspan="4">Typical Pneumonia</td><td rowspan="3">Mild - moderate</td><td>First Line</td><td>Oral Amoxicillin</td><td rowspan="3">Oral Clarithromycin (if susceptible)

OR

Add Oral Linezolid to Amoxicillin (if Clarithromycin resistant)</td><td rowspan="2">N/A</td><td rowspan="4">● Viruses account for a significant number of cases of Community Acquired Pneumonia in children and antibiotics may not be indicated

● Length of treatment depends on clinical condition but generally 3 days for Azithromycin and 5-7 days for other antibiotics for typical pneumonia. Please discuss with microbiologist for atypical pneumonia

● Discuss with microbiologist if no response after 48hrs of treatment.

If no better in 72hrs, consider empyema and manage as below</td></tr>
<tr><td>Second Line
OR
Penicillin allergic</td><td>Oral Clarithromycin

OR

Oral Azithromycin (>6 months of age)</td></tr>
<tr><td>Life-threatening penicillin allergy or cephalosporin allergy AND 2nd line contra-indicated</td><td>Discuss with the Microbiologist</td></tr>
<tr><td>Severe
i.e.
Fever >39°C
Toxicity
Cough + SOB + grunting + chest pain
Unilateral creps + bronchial breathing
CXR → lobar consolidation</td><td>First Line</td><td>IV Amoxicillin +/- Flucloxacillin (if < 2 years old)

Add in IV Clarithromycin if:-
● suspected mycoplasma or Chlamydophila and/or
● no response after 48 hrs</td><td rowspan="2">IV/oral Clarithromycin

OR

IV/oral Linezolid (unless susceptible to clarithromycin and patient is on this)</td><td>Clarithromycin
OR
Azithromycin (>6 months of age)
+/- amoxicillin
+/- linezolid (if indicated for MRSA)</td></tr>
<tr><td>Second Line
OR
Penicillin allergic</td><td>IV Clarithromycin</td><td>Clarithromycin
OR
Azithromycin (>6 months of age) monotherapy
+/- linezolid (if indicated for MRSA)</td></tr>
</table>

Type of Infection		Antibacterial agent	If MRSA positive add:	Oral switch	Comments
Atypical Pneumonia i.e. Cough + sore throat, rash CXR→ Bilateral interstitial shadows	**First Line**	IV/ Oral Clarithromycin **OR** Oral Azithromycin (>6 months of age)	IV or oral Linezolid (unless already on clarithromycin or azithromycin AND MRSA is susceptible)	As for 1st or 2nd line (Discuss with Microbiologist if 1st or 2nd line not available orally)	● Viruses account for a significant number of cases of Community Acquired Pneumonia in children and **antibiotics may not be indicated** ● Length of treatment depends on clinical condition but generally **3 days** for Azithromycin and **5-7 days** for other antibiotics for **typical pneumonia**. Please discuss with microbiologist for **atypical pneumonia** ● Discuss with microbiologist if no response after 48hrs of treatment. If no better in 72hrs, consider empyema and manage as below
	Second Line **OR** **Penicillin allergic**	Discuss with Microbiologist			
Pneumonia associated with or after significant viral illness such as Influenza, Measles or Chickenpox.	**First Line**	IV Co-amoxiclav	IV or oral Clarithromycin **OR** IV or oral Linezolid	Same as IV except for cefuroxime, in which case use Cefaclor.	
	Second Line **OR** **Penicillin allergic**	IV Cefuroxime			
	Life-threatening penicillin allergy	Contact Microbiologist for IV and oral option			

Empyema	Refer to Guidelines for Management of Parapneumonic effusions CW16.v2	Seek specialist advice from Paediatric Respiratory team and Microbiologist.

5. Skin Infections

Type of Infection		Antibacterial agent	Oral switch	Comments
Cellulitis - MILD	**First Line**	Oral Flucloxacillin	N/A	● Treat for 5-7 days or until resolution whichever is later ● Severe or Streptococcal infection: Add Amoxicillin to Flucloxacillin if no improvement after 48hrs ● Severe infection may require IV therapy
	Second Line	Oral Clarithromycin **OR** Oral Clindamycin (*if intolerant to Clarithromycin*)		
	Penicillin allergic			
	MRSA positive (if sensitive)			
	If MRSA positive and resistant to above:	Oral Linezolid		
Cellulitis – MODERATE / SEVERE **Impetigo** **Wound infection** **Infected eczema**	**First Line**	IV or oral Flucloxacillin	Same as IV option	
	Second Line	IV or oral Clarithromycin **OR** IV or oral Clindamycin (*if intolerant to Clarithromycin*)		
	Penicillin allergic			
	MRSA positive (if sensitive)			
	If MRSA positive and resistant to above:	IV or oral Linezolid		
Human / Animal Bites(established infection)	**First Line**	IV or oral Co-amoxiclav **If MRSA positive add:** IV Linezolid	As for 1st line	● Cleanse wound and consider tetanus toxoid ●Assess hepatitis B & C, HIV & rabies risk. ●Treat for 10-14 days
	For severe infections	IV Cefotaxime **AND** IV Metronidazole **If MRSA positive add:** IV Linezolid	N/A	
	Second line/ Penicillin allergic	IV or oral Clindamycin **AND** IV or Oral Ciprofloxacin	Same as IV option	
	MRSA positive (if sensitive)			
	If MRSA positive and resistant to above:	IV or oral Linezolid		

6. Urinary Tract Infections (Please refer to NICE guidance regarding further investigations)

Type of Infection	First Line Antibacterial agent	Penicillin allergic OR Second Line Antibacterial agent	Oral switch	Comments
Suspected UTI AND LESS than 3 months old	IV Cefotaxime **AND** IV Amoxicillin	Please discuss with Microbiologist	N/A	Duration of treatment should be discussed with microbiologist if likely to last more than 7 days.
Lower urinary tract infection (cystitis – i.e. no systemic signs and symptoms) AND 3 OR MORE months old	Oral Trimethoprim Consider 2nd line if: -Recent antibiotic treatment in last 3 months OR -Previous resistant organism OR -Structural renal tract abnormality	Oral Nitrofurantoin or Cefalexin ♦If life threatening penicillin allergy/cephalosporin allergy and 1st and 2nd line contra-indicated, please contact Microbiologist	Based on urine culture & sensitivities	**Total Duration of treatment IV + Oral :** Cystitis - 3 days Pyelonephritis - 10 days
Upper urinary tract infection (pyelonephritis) AND THREE OR MORE months old	IV Cefuroxime	If life threatening penicillin allergy/cephalosporin allergy: IV or oral Ciprofloxacin	Based on sensitivities but **avoid** Nitrofurantoin	

7. Eye Infections

<table>
<tr><th colspan="2">Type of Infection</th><th>Antibacterial agent</th><th>Oral switch</th><th>Comments</th></tr>
<tr><td rowspan="2">Ophthalmia Neonatorum

1.Chlamydial conjunctivitis

2. Gonococcal conjunctivitis</td><td>First Line</td><td>Oral Clarithromycin
AND
single IV Ceftriaxone dose (see BNFc)</td><td rowspan="2">N/A</td><td rowspan="2">● Treat for 14 days
● Contact tracing mandatory</td></tr>
<tr><td>Second Line
OR
Penicillin allergic</td><td>Discuss with microbiologist.</td></tr>
<tr><td rowspan="3">Severe bacterial conjunctivitis</td><td colspan="3">Discussion with the Ophthalmologist is essential. Most cases of mild conjunctivitis are allergic or viral in origin and do not require antibiotics.</td><td rowspan="3">● Continue antibiotics for 48 hrs after eyes are clear.

● Ensure correct eye swabs are taken for Chlamydia and gonococcus.

● Treatment should be adjusted based on sensitivity results</td></tr>
<tr><td>First Line</td><td>Chloramphenicol 0.5% eye drops or 1% ointment</td><td rowspan="2">N/A</td></tr>
<tr><td>Second Line
OR
Penicillin allergic</td><td>Levofloxacin eye drops (avoid in < 1 yr old)
OR
Azithromycin eye drops
OR
Fusidic acid 1% eye drops (only in suspected staphylococcal conjunctivitis)</td></tr>
</table>

<table>
<tr><th colspan="2">Type of Infection</th><th>Antibacterial agent</th><th>MRSA positive</th><th>Oral switch</th><th>Comments</th></tr>
<tr><td rowspan="3">Peri-orbital cellulitis</td><td>Mild</td><td>Oral Flucloxacillin</td><td>Use:
Oral Linezolid</td><td rowspan="4">Discuss with microbiologist</td><td rowspan="4">Consider nasal decongestant drops.

Arrange ENT and Ophthalmology review within 24 hours of admission.

Length of IV treatment depends on patient’s condition.</td></tr>
<tr><td>Moderate-severe periorbital cellulitis:</td><td>IV Co-amoxiclav</td><td>Add:
IV Linezolid</td></tr>
<tr><td>Second Line
OR
Penicillin allergic</td><td colspan="2">Discuss with microbiologist if penicillin allergic or no response after 48hrs of treatment</td></tr>
<tr><td>Orbital cellulitis</td><td>First Line</td><td>IV Cefotaxime AND IV Metronidazole</td><td>Add:
IV Linezolid</td></tr>
</table>

8. Bone and Joint Infections

Please refer to the Adult Orthopaedic and Trauma guidelines for further information

Type of Infection	Antibacterial agent	Antibacterial agent	MRSA positive	Oral switch		Comments
Osteomyelitis/ Septic Arthritis (>5 yrs)	**First Line**	IV Flucloxacillin	**Use:** IV Clindamycin (if susceptible) **OR** IV Teicoplanin (if clindamycin resistant)	Same as IV option **If MRSA positive:** Discuss with Microbiologist		Full intravenous course may be required. For duration of treatment, please refer to the Trust Orthopaedic and Trauma antibiotic guidelines Discuss with Consultant Microbiologist
	Second Line OR Penicillin allergic	IV Clindamycin				
Osteomyelitis/ Septic Arthritis (≥ 3 months ≤5yrs)	**First Line**	IV Cefuroxime	**Add:** IV Teicoplanin (based on sensitivity results)	**First line:** Co-amoxiclav		
	Life threatening penicillin allergy/ cephalosporin allergy:	IV or oral Ciprofloxacin **AND** IV Teicoplanin (check MRSA results if indicated)		**Second line:** Clindamycin **If MRSA positive resistant to Clindamycin:** Discuss with the Microbiologist		
Osteomyelitis/ Septic Arthritis (<3months old)	**First line**	IV Cefotaxime **AND** IV Amoxicillin	**Add:** IV Teicoplanin (based on sensitivity results)	As in suspected sepsis or meningitis. Seek specialist advice from Orthopaedics & Microbiology		
Compound fracture (A&E initial therapy)	**First line**	IV Co-amoxiclav	**Add:** IV Teicoplanin if not already on this (based on sensitivity results)	Co-amoxiclav	**If MRSA positive:** Discuss with Microbiologist	Review need for continuing therapy as advised by Consultant orthopaedic surgeon.
	Second Line OR Penicillin allergic (mild)	IV Cefuroxime **AND** IV Metronidazole		Cefalexin **AND** Metronidazole		
	Life-threatening penicillin allergy/cephalosporin allergy	IV or oral Ciprofloxacin **AND** IV or oral Metronidazole **AND** IV Teicoplanin		Discuss with Microbiologist		

9. Central Nervous System Infections and / or suspected sepsis of unknown origin

NOTE: AS IN CHILDRENS BNF FOR SEVERE INFECTION USE HIGHEST RECOMMENDED DOSE

<table>
<tr><th colspan="2">Type of Infection</th><th>Antibacterial agent</th><th>Comments</th></tr>
<tr><td rowspan="2">Bacterial Meningitis
OR
Meningococcal sepsis

THREE OR MORE months old</td><td>First Line</td><td>IV Cefotaxime
[The dose for severe infection is 50mg/kg FOUR times a day (maximum 12 grams per day)]

OR

IV Ceftriaxone
[The dose for severe infection is 80mg/kg (maximum FOUR grams) once a day)]</td><td rowspan="4">Full course of parenteral therapy. Oral switch not recommended - discuss with Microbiologist.

Duration of treatment:

●Meningococcal 7 days

●H. influenzae 10 days

●Pneumococcal 14 days

●Group B Streptococcus at least 14 days

●Gram negative organisms at least 21 days

●Listeria 21 days in total and at least 7 days of Gentamicin

●Unconfirmed organism: ≥14 days for children LESS THAN THREE months old OR ≥10days for children THREE OR MORE months old</td></tr>
<tr><td>Life-threatening penicillin allergy/ cephalosporin allergy</td><td>IV Chloramphenicol</td></tr>
<tr><td rowspan="3">Neonatal meningitis/ sepsis

Up to THREE months old</td><td>First Line</td><td>IV Cefotaxime
AND
IV Amoxicillin</td></tr>
<tr><td>Life-threatening penicillin allergy/ cephalosporin allergy</td><td>Discuss with Microbiologist</td></tr>
<tr><td colspan="2">Please discuss with the Microbiologist regarding the specific antibiotic to be used for a specific organism, including if MRSA colonised. Please notify Public Health.</td></tr>
<tr><td>Viral encephalitis</td><td>IV Aciclovir

USE CORRECT HIGH DOSE AS IN BNFC</td><td>Contact virologist at NGH (Sheffield)</td><td>Treat for at least 21 days.

Liaise with the virologist at NGH (Sheffield)</td></tr>
</table>