Doncaster and Bassetlaw Teaching Hospitals
NHS Foundation Trust

PAEDIATRIC ANTIMICROBIAL GUIDELINE

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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 UKPAS 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 (e.g. clinical findings, radiological/biochemical results, antibiotic history etc) is available to hand before contacting microbiologists

GOOD AMS PRACTICE POINTS

- Avoid JUST IN CASE prescribing - particularly for viral febrile illnesses which are common in children
- Review previous microbiology results e.g. is there a previous history of resistant organisms such as ESBL or MRSA that needs consideration?
    - ESBL (Extended Spectrum Beta Lactamase)-producing bacteria break down penicillins and cephalosporins, making these common antibiotics ineffective. Discuss with Consultant in Infection if unsure.
    - Consider the need for anti-MRSA antibiotic in patients who are MRSA positive.
- Antibiotics are drugs with significant side effect profile resulting in changes to microbiome, atopic signalling and development of antimicrobial resistance – please THINK before prescribing.
- Send appropriate diagnostic samples (e.g. blood cultures, urine samples, viral swab) ideally before starting antibiotic
- When prescribing antibiotics, document the indication in the notes
- Review antibiotics at 48 – 72h and consider IVOS where appropriate or discontinuing antibiotics if bacterial infection is excluded

- Limit antibiotic durations to the minimum effective duration - 5 – 7d courses are usually adequate for most uncomplicated infections unless otherwise specified.

2. Gastrointestinal Infections

Type of Infection		Antibiotic	Oral switch *when clinically indicated*	Duration / Comments
Appendicitis/ Peritonitis	**First Line**	IV Co-amoxiclav	Co-amoxiclav	Length of treatment depends on clinical condition but generally 5-7 days. In simple appendicitis (not perforated or gangrenous), IV pre-op, stop immediately post op. Antibiotics should be modified based on sensitivity results.
	Second line OR low risk penicillin allergy	IV Cefuroxime **AND** IV/PO Metronidazole	Cefalexin **AND** Metronidazole	
	High risk penicillin allergy	IV Clindamycin **AND** Gentamicin	Cotrimoxazole **AND** Metronidazole	
Infectious diarrhoea **(Notifiable infections)**	**Salmonella (non-typhoidal)**	Self-limiting unless chronic GI tract disease, haemoglobinopathy, <6 months old, malignancy or immunocompromised		If severe symptoms or immunocompromised/high risk, discuss with Consultant Microbiologist
	Shigella	Usually self-limiting		
	Campylobacter	Usually self-limiting		If systemically unwell or protracted symptoms >1 week, consider treatment with PO Clarithromycin for 5 – 7 days
	E.coli Shiga toxin producing (STEC) e.g. 0157 H7	**Do not treat with antibiotics, as this may lead to an increase in toxin release.**		May lead to haemolytic-uraemic syndrome (HUS).
	C.difficile infection	Severe or recurrence (after >12 weeks) • PO Vancomycin Life-threatening • PO Vancomycin + IV Metronidazole Relapse (<12 weeks after 1st episode) or second line: • Fidaxomicin PO		Refer to the trust *C. difficile* policy **PAT/IC 26**. Use BNF for children for dosage information. Duration 10 – 14 days Presence of Clostridium difficile toxin is not usually clinically significant in children under 2 years old.

3. Upper Respiratory Tract Infections

<table>
<tr><th colspan="2">Type of Infection</th><th>Antibiotic</th><th>If MRSA positive <u>add:</u></th><th>Oral switch</th><th>Duration /Comments</th></tr>
<tr><td rowspan="2">Acute Epiglottitis</td><td>First Line</td><td>IV Cefotaxime
OR IV Ceftriaxone</td><td rowspan="2">IV Teicoplanin

OR

Oral/IV Cotrimoxazole (if sensitive)</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 5 days.

Base oral switch on sensitivity results where available.</td></tr>
<tr><td>High risk penicillin/ cephalosporin allergy</td><td>IV Clindamycin + Ciprofloxacin</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. Antibiotics vs placebo demonstrated 88% vs 84% no pain at 2 – 3 days if no otorrhoea.
Consider paracetamol / ibuprofen + anaesthetic/analgesic ear drops (phenazone with lidocaine, e.g. Otigo)</td></tr>
<tr><td rowspan="2">If systemically unwell, or high risk of complications
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

Standard duration: 5 days
If severe or recurrent infection: 7 days

If Azithromycin prescribed:
● Treat for 3 days</td></tr>
<tr><td>Recurrent infection or failure after 48hrs of Amoxicillin: Oral/IV Co-amoxiclav</td></tr>
<tr><td>Second line or Low risk penicillin allergy</td><td>Oral/ IV Clarithromycin OR Oral Azithromycin (>6 months of age)</td></tr>
<tr><td>Third line or High risk penicillin or cephalosporin allergy</td><td colspan="3">IV/PO Cotrimoxazole</td></tr>
</table>

<table>
<tr><td rowspan="6">Sinusitis: Mild</td><td>Symptoms < 10 days</td><td colspan="3">Treat with paracetamol or ibuprofen for pain</td><td></td></tr>
<tr><td rowspan="2">If symptoms not improving for >10 days:
First Line</td><td>Oral/IV Amoxicillin</td><td rowspan="5">Oral/IV clarithromycin (if susceptible and not already on)

OR

Oral/IV Linezolid</td><td rowspan="5">As for first/second line oral choice +/- MRSA cover where indicated</td><td rowspan="5">For Azithromycin, treat for 3 days.

Otherwise treat for 5 days</td></tr>
<tr><td>Failure after 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>Failure after 48hrs second line: IV Cefuroxime or oral Cefaclor</td></tr>
<tr><td rowspan="2">Sinusitis: Severe or systemically unwell</td><td>First line</td><td>Oral/IV Co-amoxiclav</td></tr>
<tr><td>Second line/penicillin allergy</td><td>Oral/IV Clarithromycin</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

Oral/IV Linezolid</td><td rowspan="2"></td><td rowspan="2">Treat for 5 days (except for azithromycin which is 3 days)

If recurrence/relapse within 2 weeks, 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>
</table>

Peritonisillar abscess	**First line**	IV Benzylpenicillin PO switch: Penicillin V Failure after 48h Benzylpenicillin: IV/PO Co-amoxiclav	Oral/IV Clindamycin (if susceptible and not already on) OR Oral/IV Linezolid	As for first/second line oral choice +/- MRSA cover where indicated	7 days
	Second line/penicillin allergy	IV/PO Clindamycin			
Pertussis	**First Line**	IV or Oral Clarithromycin **OR** Oral Azithromycin (>6 months of age)		Clarithromycin **OR** Azithromycin	● Azithromycin: treat for 3 days. Otherwise treat for 7 days ● Commence treatment within 21 days of onset. Notifiable disease
	Second line	IV or oral Co-trimoxazole		Co-trimoxazole	

4. Lower Respiratory Tract Infections

Type of Infection			Antibiotic	If MRSA positive add:	Oral switch	Duration / Comments
Community Acquired Pneumonia	**Mild - moderate**	**First Line**	Oral Amoxicillin	Oral Clarithromycin (if susceptible) **OR** Add Oral Linezolid to Amoxicillin (if Clarithromycin resistant)	N/A	● 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 **5-10 days** for other antibiotics. ● 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	Oral Clarithromycin **OR** Oral Azithromycin (>6 months of age)			
		Third line (if above contra-indicated)	Oral Doxycycline (if > 8years old)			
	Severe i.e. Fever >39°C Toxicity Cough + SOB + grunting + chest pain Unilateral creps + bronchial breathing **CXR** → lobar consolidation	**First Line**	IV Coamoxiclav Add in IV/PO Clarithromycin (if suspected mycoplasma or Chlamydophila)	IV/oral Clarithromycin (if susceptible and not already on this) **OR** IV/oral Linezolid	PO Co-amoxiclav +/- PO Clarithromycin +/- MRSA cover where indicated	
		Low risk penicillin allergy/Second Line	IV Cefuroxime Add in IV/PO Clarithromycin (if suspected mycoplasma or Chlamydophila)		PO Cefaclor + PO Clarithromycin +/- MRSA cover where indicated	
		High risk penicillin allergy	IV Teicoplanin **AND** IV Ciprofloxacin	No change (teicoplanin provides MRSA cover)	Discuss with Microbiologist.	

<table>
<tr><th colspan="2">Type of Infection</th><th>Antibiotic</th><th>If MRSA positive add:</th><th>Oral switch</th><th>Comments</th></tr>
<tr><td rowspan="2">Atypical Pneumonia (e.g. Mycoplasma, Chlamydia trachomatis (<4 months old), pertussis)

Features to increase suspicion:

• Treatment failure after 3d beta lactam
• Older children >5 years
• Prolonged fever + respiratory symptoms (>6 days)
• Low CRP (<50mg/L)
• Mucocutaneous lesions

CXR findings cannot distinguish between Mycoplasma pneumonia and other causes</td><td>First Line</td><td>IV/ Oral Clarithromycin

OR

Oral Azithromycin (>6 months of age)</td><td>IV or oral Linezolid

(unless already on clarithromycin/ azithromycin AND MRSA is susceptible)</td><td rowspan="2">PO Clarithromycin +/- MRSA cover where indicated</td><td rowspan="3">● 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 5-10 days including po switch for other antibiotics.

● 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</td><td colspan="2">Discuss with Microbiologist</td></tr>
<tr><td rowspan="2">Pneumonia associated with or after significant viral illness such as Influenza, Measles or Chickenpox.</td><td>First Line</td><td>IV Co-amoxiclav</td><td rowspan="2">IV or oral Clarithromycin

OR</td><td rowspan="2">Same as IV except for cefuroxime, in which case use Cefaclor.</td></tr>
<tr><td>Second Line OR Low risk Penicillin allergy</td><td>IV Cefuroxime</td></tr>
</table>

	High risk penicillin allergy	Contact Microbiologist for IV and oral option	IV or oral Linezolid		

Empyema	**First line**	IV Co-amoxiclav	IV/PO Linezolid	Co-amoxiclav	Treat for 2 – 3 weeks (less if small effusion) Refer to Guidelines for Management of Parapneumonic effusions CW16.v2 Seek specialist advice from Paediatric Respiratory team and Microbiologist.
	Low risk penicillin allergy / Second line	IV Cefuroxime **AND** IV/PO Metronidazole		Cotrimoxazole **AND** metronidazole	
	High risk penicillin allergy / Third line	IV Ciprofloxacin **AND** IV Clindamycin	Discuss with Microbiologist	Clindamycin	

5. Skin Infections

Type of Infection		Antibiotic	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/PO Linezolid	As for 1st line	● Cleanse wound and consider tetanus toxoid ●Assess hepatitis B & C, HIV & rabies risk. ●Treat for 5 – 7 days
	For severe infections/deep bites	IV Cefotaxime **AND** PO 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)

<table>
<tr><th colspan="2">Type of Infection</th><th>First Line Antimicrobial</th><th>Penicillin allergic OR Second Line Antibiotic</th><th>Oral switch</th><th>Duration / Comments</th></tr>
<tr><td rowspan="2">Suspected UTI
< 3 months old</td><td>Not severe sepsis</td><td>IV Cefotaxime</td><td rowspan="2">Discuss with Microbiologist</td><td rowspan="2">Based on cultures/sensitivities

If culture negative, use high dose PO Cefalexin</td><td rowspan="2">7 – 10 days based on clinical response</td></tr>
<tr><td>Severe sepsis</td><td>IV Cefotaxime
AND Gentamicin
single dose</td></tr>
<tr><td colspan="2" rowspan="2">Lower urinary tract infection (cystitis – i.e. no systemic signs and symptoms)

≥ 3 months old</td><td rowspan="2">PO Nitrofurantoin

OR

PO Pivmecillinam if >40kg

(If unable to swallow tablets use second line)</td><td rowspan="2">PO Cefalexin
OR
If recent culture with sensitive organism, use:

PO Trimethoprim

♦If high risk penicillin allergy/cephalosporin allergy and 1st and 2nd line contra-indicated, please contact Microbiologist</td><td rowspan="2">Trimethoprim OR
Cefalexin
OR Nitrofurantoin
OR
Amoxicillin
(based on sensitivities)</td><td rowspan="3">If ESBL, use narrowest spectrum antibiotic based on sensitivities.
NB – Cephalosporins/penicillin antibiotics are ineffective

Total Duration of treatment IV + Oral :

Cystitis - 3 days

Pyelonephritis – 7-10 days</td></tr>
<tr><td rowspan="2">Upper urinary tract infection (pyelonephritis)

≥ 3 months old</td><td>Not severe sepsis</td><td>IV Cefuroxime</td><td rowspan="2">IV/PO Ciprofloxacin</td><td rowspan="2">Based on sensitivities but avoid Nitrofurantoin</td></tr>
<tr><td>Severe sepsis</td><td>IV Cefotaxime AND Gentamicin single dose</td></tr>
</table>

7. Eye Infections

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

1.Chlamydial conjunctivitis

2.Gonococcal conjunctivitis

3.HSV conjunctivitis</td><td>First Line</td><td>Oral Erythromycin
AND
Single dose IV Cefotaxime dose (see BNFc)
AND
Chloramphenicol eye drops

Add IV Aciclovir if concerns regarding HSV</td><td rowspan="2">N/A</td><td rowspan="2">• PO antibiotic 14d
• Eye drops for 5 days
• If IV aciclovir treatment required, 14 days
• Seek urgent ophthalmology review
• Send correct eye swabs (NAAT) for Chlamydia and gonococcus
• Consider HSV if vesicles
• Contact tracing mandatory for Chlamydia and gonorrhoea</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. Consider sterile saline or cooled boiled water.</td><td rowspan="3">● Continue antibiotics for 48 hrs after eyes are clear.

● 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</td><td>Gentamicin 0.3% eye drops
OR
Fusidic acid 1% eye drops (only in staphylococcal conjunctivitis)</td></tr>
</table>

Type of Infection			Antibiotic	MRSA positive	Oral switch	Duration / Comments
Pre-septal cellulitis	**Mild – moderate**	**First line**	PO Co-amoxiclav	**Use:** Oral Linezolid	As previous	**Mild-moderate pre-septal cellulitis: 5 days** **Severe pre-septal cellulitis: 10 days** **Orbital cellulitis: Continue until clinical resolution. Expected to require 2 – 4 weeks treatment.** **Discuss with Microbiology if no improvement after 48 - 72h** Arrange ENT and Ophthalmology review within 24 hours of admission.
		Second line or Penicillin allergy	PO Clindamycin			
	Severe	**First line**	IV Co-amoxiclav	**Add:** IV Linezolid	Co-amoxiclav	
		Second line or penicillin allergy	PO Clindamycin **AND** IV Ciprofloxacin		Clindamycin **AND** Ciprofloxacin	
Orbital cellulitis	**First Line**		IV Cefotaxime **AND** PO Metronidazole	**Add:** IV Vancomycin	Co-amoxiclav	
	Second line or high risk penicillin/cephalosporin allergy		IV Ciprofloxacin **AND** IV/PO Clindamycin		Clindamycin **AND** Ciprofloxacin	

8. Bone and Joint Infections

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

Type of Infection	Antibacterial agent	Antibiotic	MRSA positive	Oral switch	Duration / Comments
Osteomyelitis/ Septic Arthritis (>5 yrs)	**First Line**	IV Flucloxacillin	**Use:** IV Clindamycin or Cotrimoxazole (if susceptible) **OR** IV Teicoplanin	Flucloxacillin **If MRSA positive:** Discuss with Microbiologist	2 – 3 weeks in septic arthritis 3 – 4 weeks in osteomyelitis
	Second Line **Low risk penicillin allergy**	IV Ceftriaxone		Cotrimoxazole	
	High risk penicillin allergy	IV Cotrimoxazole			
Osteomyelitis/ Septic Arthritis (3 months-5yrs)	**First Line**	IV Cefuroxime	**Add:** IV Teicoplanin	**First line (after 7 – 14 days):** High dose PO Cefalexin	
	High risk penicillin / cephalosporin allergy:	IV Cotrimoxazole	**If MRSA resistant to cotrimoxazole: Discuss with Microbiologist**	**Second line: Co-trimoxazole** **If MRSA positive and resistant to Cotrimoxazole:** Discuss with the Microbiologist	
Osteomyelitis/ Septic Arthritis (<3months old)	**First line**	IV Cefotaxime	**Add:** IV Teicoplanin	First line (after 7 – 14 days): High dose PO Cefalexin If MRSA positive, PO Cotrimoxazole (if sensitive) or discuss with microbiology	Seek specialist advice from Orthopaedics & Microbiology

Compound fracture (A&E initial therapy)	**First line**	IV Co-amoxiclav	**Add:** IV Teicoplanin	Not applicable	Grade 1: 24 hours Grade 2 – 3: 72 hours or until wound closure (whichever is sooner) Review need for continuing therapy as advised by Consultant orthopaedic surgeon.
	Second Line **OR** **Low risk penicillin allergy**	IV Cefuroxime **AND** IV Metronidazole Add single dose Gentamicin at 1st debridement			
	High risk penicillin /cephalosporin allergy	IV Clindamycin Add single dose Gentamicin at 1st debridement			

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

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

Type of Infection		Antimicrobial	Duration / Comments
Neonatal Meningitis / Encephalitis < 1 month old	**First line**	IV Cefotaxime **AND** IV Amoxicillin **+/-** IV Aciclovir	Add IV aciclovir only if seizures, focal neurological symptoms or known exposure to HSV infection If ESBL or MRSA colonised, discuss with Microbiologist Oral switch not recommended. **Duration of treatment:** ●Meningococcal 5 days ●*H. influenzae* 7-10 days ●Pneumococcal 10 days ●Group B *Streptococcus* 14 days ●Gram negative organisms at least 21 days ●*Listeria* 21 days ●Culture and PCR negative but clinically suspected bacterial meningitis: < 3 months old: 14 days ≥ 3 months old: 10 days **Please notify UKHSA any suspected meningitis or meningococcal sepsis.**
	Low risk penicillin allergy	IV Cefotaxime **AND** IV Cotrimoxazole **+/-** IV Aciclovir	
	High risk penicillin allergy	IV Meropenem **+/-** IV Aciclovir	
Bacterial Meningitis OR Meningococcal sepsis **>1 month old**	**First Line**	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)]	
	High risk penicillin / cephalosporin allergy	IV Meropenem	
Viral encephalitis	IV Aciclovir	Contact virologist at Northern General Hospital (Sheffield)	< 12 years old or immunosuppressed: • 21 days, then repeat LP >12 years old: • 14 days, then repeat LP