Sheffield Children's NHS
NHS Foundation Trust

Antimicrobial Dosing Guideline

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Purpose

This guideline is to be used in conjunction with Sheffield Children's NHS Foundation Antimicrobial Formulary to aid the clinician in prescribing the most appropriate antimicrobial(s) at the appropriate dose. The dosing in this guideline should be used in preference to BNFc guidance.

Intended Audience

For use by healthcare professionals at Sheffield Children's NHS Foundation Trust who are required to calculate antimicrobial doses for patients as part of their treatment plan.

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1. Introduction

Appropriate antimicrobial dosing is crucial when treating a patient for infection. A dose that is too low may deliver suboptimal treatment. This can compromise patient's clinical outcome, furthermore, putting the patient at risk of antimicrobial resistance. Whereas a dose that is too high may expose the patient to unnecessary side effects.

Providing structured guidance surrounding the dosing of antimicrobials ensures the patient is prescribed the optimal dose and is one way of tackling drug resistant infection.

2. Intended Audience

For use by healthcare professionals at Sheffield Children's NHS Foundation Trust who are required to calculate antimicrobial doses for inpatients at Sheffield Children's NHS Foundation Trust.

The doses included in this guideline are for patients with renal function, hepatic function, and a body mass index (BMI) within the normal range. Dose adjustment may be required for patients outside of these parameters. If so, these is indicated within each "drug table" and please contact pharmacy for further guidance. Deviation from the guidance must be documented in the patient notes.

Please refer to separate guidelines when calculating antimicrobial doses for the cohorts of patients with the following diagnoses:

1. Cystic Fibrosis
2. Haematology/oncology
3. Mycobacterium tuberculosis

Additionally, there will sometimes be specific patients and/or infections that will require different dosing regimens to those outlined in this guideline. Where relevant these will be recommended by Microbiology, Infectious Diseases or Pharmacy.

Take special care when dosing in the premature infant. For antimicrobials that are dosed as per the corrected gestational age this is indicated as per the drug table. Prescribe the most appropriate dose for the severity of infection and monitor for clinical response whilst minimising risk of side effects. For patients that remain <37 weeks gestational age and <4 weeks chronological age liaise with pharmacy as necessary.

When a dosing monograph states that dose adjustments are required in specific patient group, such as obesity, renal impairment or hepatic impairment please refer to the relevant Sheffield Children's guideline. These guidelines will provide further instruction for the specific dosing adjustments that may be required.

3. Guideline Content

ACICLOVIR				
Drug class: Anti-viral				
Dose adjustment required: renal impairment, obesity				
INTRAVENOUS				
Indication	**<1 month**	**1-<3 months**	**3 months – <12 years**	**12 – 17 years**
HSV or VZV encephalitis/ meningitis	20mg/kg 8 hourly	20mg/kg 8 hourly	500mg/m^2 8 hourly	10mg/kg 8 hourly
HSV or VZV treatment (immunocompromised)				
HSV or VZV treatment (immunocompetent)	20mg/kg 8 hourly	20mg/kg 8 hourly	250mg/m^2 8 hourly	5mg/kg 8 hourly
ENTERAL Bioavailability of oral preparation limited and not suitable for severe infection				
Indication	**1-<2 years**	**2-<6 years**	**6-<12 years**	**12-17 years**
HSV prophylaxis (immunocompromised)	100-200mg 6 hourly	200-400mg 6 hourly	200-400mg 6 hourly	200-400mg 6 hourly
HSV treatment (immunocompetent)	100mg 5 times/day	200mg 5 times/day	200mg 5 times/day	200mg 5 times/day
HSV treatment (immunocompromised /impaired absorption)	200mg 5 times/day	400mg 5 times/day	400mg 5 times/day	400mg 5 times/day
VZV (chickenpox or shingles) treatment	200mg 6 hourly	400mg 6 hourly	800mg 6 hourly	800mg 5 times/day

AMIKACIN

Drug class: Aminoglycoside

Dose adjustment required: renal impairment, obesity

INTRAVENOUS

Indication	0-28 days*	1 month - 17 years
All indications – once daily dosing (non-CF patient)	15mg/kg once daily	15mg/kg once daily (max 1.5g per dose)

Additional notes:
Amikacin must not be initiated in any patient unless under the advice of a microbiology or infectious diseases consultant. *If patient <2kg consider extending dosing interval <48 hours.

Therapeutic Drug Monitoring:
Therapeutic Drug Monitoring must occur in all patients receiving aminoglycosides.
A trough level must be completed prior to the second dose of amikacin being given.
Peak levels are not required.
Blood should **never** be taken from the cannula being used for dosing as this result in erroneous levels.
Do not wait for the results of a level before giving the next dose providing there is not concern of renal toxicity or ototoxicity.
In children with normal renal function the following applies (if patient has renal impairment speak to pharmacy or microbiology for advice):

Once daily dosing				
Description	**When**	**Level**	**Action**	**Comment**
Pre-dose or "trough" level	Within 30 minutes of second dose	<5mg/L	Continue	Repeat twice weekly if renal function stable
		>5mg/L	Potentially toxic levels	Seek advice from microbiology or pharmacy before continuing therapy

AMOXICILLIN

Drug class: Penicillin (Beta-lactam)

Dose adjustment required: renal impairment, caution severe hepatic impairment

INTRAVENOUS

Indication	<7 days	7-28 days	>1 month – 17years
Sepsis, meningitis	100mg/kg 12 hourly	100mg/kg 8 hourly	50mg/kg (Max. 2g per dose) 4 hourly
Other severe infections	60mg/kg 12 hourly	60mg/kg 8 hourly	60mg/kg (Max. 1g per dose) 8 hourly
Mild infections (with poor enteral absorption)	30mg/kg 12 hourly	30mg/kg 8 hourly	30mg/kg (Max. 1g per dose) 8 hourly

ENTERAL

Indication	7-28 days	1 – <12 months	1-<5years	5-17 years
Susceptible infection	30mg/kg (max 125mg per dose) 8 hourly	125mg 8 hourly	250mg 8 hourly	500mg 8 hourly (Max.1g 8 hourly)

Additional note: If treating confirmed *Haemophilus influenzae* please refer to guideline Antimicrobial Highest Safe Dosing Guidance CAEC 1991

AUGMENTIN

See co-amoxiclav

AZITHROMYCIN

Drug class: Macrolide

Dose adjustment required: Severe renal impairment, caution severe hepatic impairment

ENTERAL

Indication	<15kg (≥6 months)	15-25kg	26-35kg	36-45mg	>45kg
Treatment of infection	10mg/kg Once daily	200mg Once daily	300mg Once daily	400mg Once daily	500mg Once daily

BENZYLPENICILLIN

Drug class: Penicillin (beta-lactam)

Dose adjustment required: renal impairment (risk of accumulation of sodium).

INTRAVENOUS

Indication	0-6 days	7-28 days	>28 days
Neonatal sepsis	50mg/kg 12 hourly	50mg/kg 8 hourly	-
Severe infections including severe cellulitis & pneumonia	50mg/kg 12 hourly	50mg/kg 8 hourly	50mg/kg (Max. 2.4g per dose) 6 hourly (Dosing interval can be reduced 4 hourly)
Mild-moderate infections (where enteral delivery unreliable)	25mg/kg 12 hourly	25mg/kg 8 hourly	25mg/kg 6 hourly

Additional notes: The most appropriate oral switch from benzylpenicillin is to amoxicillin unless the patient has a throat infection when penicillin V can be used.

CASPOFUNGIN

Drug class: Echinocandin

Dose adjustment: hepatic impairment

INTRAVENOUS

Indication	0->3 months	3-<12 months	>12 months
All indications	25mg/m^2 Once daily	50mg/m^2 Once daily	Day 1: 70mg/m^2 (Max. dose 70mg) once daily Day 2 onwards: 50mg/m^2 (Max. dose 70mg) once daily

CEFACLOR

Drug class: Cephalosporin (beta-lactam)

Dose adjustment: renal impairment

ENTERAL

Indication	1-<12 months	1-<5years	>5 years
Bacterial chest infection	62.5mg 8 hourly	125mg 8 hourly	250mg 8 hourly
Bacterial chest infection (severe infection or less susceptible organisms)	125mg 8 hourly	250mg 8 hourly	500mg 8 hourly

Additional notes: Rarely used for other indications. Dosing may vary. Please discuss with Microbiology, Paediatric Infectious Diseases or Pharmacy.

CEFALEXIN							
Drug class: Cephalosporin (beta-lactam)							
Dose adjustment: renal impairment							
ENTERAL							
Indication	**0-6 days**	**7-20 days**	**21-28 days**	**1-<12 months**	**1-<5 years**	**5-<12 years**	**12-17 years**

CEFTRIAXONE			
Drug class: Cephalosporin (beta-lactam)			
Dose adjustment: renal impairment			
INTRAVENOUS			
Indication	**0-14 days***	**15-28 days**	**>28 days**
Sepsis, meningitis & other CNS infections	50mg/kg Once daily	80mg/kg Once daily	80mg/kg (max. dose 4g) Once daily
Other infections	50mg/kg Once daily	50mg/kg Once daily	50mg/kg (max. dose 2g*) Once daily

Administration:
Patients > 28 days age and doses 80mg/kg: Ceftriaxone can be administered as a 10 – minute rapid infusion.

Patients ≤ 28 days age (minimum 37 weeks CGA): Ceftriaxone must always be administered as a 60-minute infusion in all indications.

Ceftriaxone must not be administered simultaneously with calcium containing intravenous solutions.

Additional notes:

In patients receiving long courses of ceftriaxone (>2 weeks) consider adjusting dose to a maximum of 2g once the patient has stabilised to reduce risk of side effects from long term use.

*If administering to a neonate ensure minimum 37 weeks corrected gestational age

INTRAMUSCULAR

Dosing as for IV administration.

IM doses of ceftriaxone are painful, even when mixed with a local anaesthetic.
IM doses should only be considered when the IV route is not available and an enteral antibiotic is inappropriate.
IM administration should be used for the shortest possible time.

Total daily doses >2g should be given intravenously where possible. If completely unavoidable consider splitting the dose and giving more frequently.

All doses >1g should be divided between more than one site and lower doses may also need to be given between more than one site in young children to minimise the pain associated with a single large injection.

Some brands of ceftriaxone can be diluted with lidocaine to 350mg/ml to reduce the volume required for intramuscular injection. See the purple guide and speak to pharmacy for further information and supply if not available on the ward.

CEFTAZIDIME

Drug class: Cephalosporin (beta-lactam)

Dose adjustment: renal impairment and caution in severe hepatic impairment

INTRAVENOUS

Indication	0-6 days	7-20 days	21-28 days	>1 month
Pseudomonas infection (CNS penetration &/or sepsis)	50mg/kg Once daily	50mg/kg 12 hourly	50mg/kg 8 hourly	50mg/kg 8 hourly (Max. 6g per day)

Additional note: This is in accordance with the guideline Antimicrobial Highest Safe Dosing Guidance CAEC 1991

CEFOTAXIME

Drug class: Cephalosporin (beta-lactam)

Dose adjustment: renal impairment

INTRAVENOUS

Indication	0-6 days	7-20 days	21-28 days	>1 month
Meningitis, sepsis, acute epiglottitis	50mg/kg 12 hourly	50mg/kg 8 hourly	50mg/kg 6 hourly	50mg/kg 6 hourly (Max. 12g per day)

CEFUROXIME

Drug class: Cephalosporin (beta-lactam)

Dose adjustment: renal impairment

INTRAVENOUS

Indication	0-6 days	7-20 days	21-28 days	> 1 month
Sepsis Intra-abdominal infections Severe infections inc: Infections assoc. with, severe pneumonia, osteomyelitis and/or septic arthritis	50mg/kg 12 hourly	50mg/kg 8 hourly	50mg/kg 6 hourly	50mg/kg (Max. dose 1.5g) 8 hourly
UTI, LRTI	25mg/kg 12 hourly	25mg/kg 8 hourly	25mg/kg 6 hourly	25mg/kg (Max. dose 1.5g) 8 hourly

Additional note: If treating confirmed *enterobacterales* please refer to guideline Antimicrobial Highest Safe Dosing Guidance CAEC 1991

CIPROFLOXACIN

Drug class: Fluoroquinolone

Dose adjustment: renal impairment, obesity.
Beware of interactions- risk of QT prolongation.

Important safety information:
Fluoroquinolone antibiotics are associated with multiple potential side effects.
Please refer to BNFC/MHRA guidance and counsel patients and carers.
Always provide medicines of children information leaflet when prescribing courses of ciprofloxacin.
Ciprofloxacin for bacterial infection – Medicines For Children

INTRAVENOUS

Indication	0-28 days	>28 days
Sepsis (where no other antibiotic available)	Not indicated	10mg/kg (Max. dose 400mg) 8 hourly
LRTI (where no other antibiotic available)	10mg/kg 12 hourly	10mg/kg (Max. dose 400mg) 8 hourly
UTI (where no other antibiotic available)	6mg/kg 12 hourly	6mg/kg (Max. dose 400mg) 8 hourly

Additional notes: The enteral bioavailability of ciprofloxacin is excellent. IV ciprofloxacin should only be used when the enteral absorption or delivery is compromised, and when no other IV agent is appropriate.

ENTERAL

Indication	0-28 days	1 month – <5 years	5-<12 years	>12 years
UTI (where no other antibiotic available)	10mg/kg 12 hourly	10mg/kg (Max. dose 750mg) 12 hourly		
LRTI (where no other antibiotic available) Severe animal/human bites (patients with penicillin allergy)	15mg/kg 12 hourly	20mg/kg (Max. dose 750mg) 12 hourly		
Meningococcal prophylaxis	30mg/kg (Max. dose 125mg) Single dose	125mg Single dose	250mg Single dose	500mg Single dose

Additional notes: Ciprofloxacin is poorly absorbed when given by a NJ or PEJ. Dose adjustment may be required – please discuss with Pharmacy.

If treating confirmed *Acinetobacter, Pseudomonas, Staphylococcus* please refer to guideline Highest Safe Dosing Guidance CAEC 1991

CLARITHROMYCIN

Drug class: Macrolide

Dose adjustment: renal impairment, obesity
Macrolides may cause QT prolongation.

INTRAVENOUS

Indication	0-<1 month	1 month – <12 years	12-17 years
All indications	7.5mg/kg 12 hourly	7.5mg/kg (Max. dose 500mg) 12 hourly	500mg 12 hourly

Additional notes: The enteral bioavailability of clarithromycin is excellent. Switch to enteral route as soon as the delivery and absorption is satisfactory.
IV clarithromycin readily causes phlebitis and should not be given through a cannula or line where the patency of the line is in question. A large peripheral vein should be used when no central access if available.

For further information regarding dosing clarithromycin <1 month see Jessop's dosing monograph, Sheffield Teaching Hospital.

ENTERAL

Indication	<8kg	8-11kg	12-19kg	20-29kg	30-40kg	>40kg
All indications	7.5mg/kg 12 hourly	62.5mg 12 hourly	125mg 12 hourly	187.5mg 12 hourly	250mg 12 hourly	500mg 12 hourly

CLINDAMYCIN

Drug class: lincosamide

Dose adjustment: No adjustment required.
Isolates susceptible to erythromycin/clarithromycin can be assumed to also be susceptible to clindamycin.
Note that clindamycin is not a macrolide antibiotic and can therefore be given to those with macrolide allergy (providing there is not a co-existing lincosamide allergy)
Monitor liver and renal function in patients receiving long courses of treatment (>2 weeks).

INTRAVENOUS

Indication	0-7 days (>2kg)	8-28 days (>2kg)	>28 days
Sepsis, severe infection	5mg/kg 8 hourly	5mg/kg 6 hourly	10mg/kg (Max. dose 900mg) 6 hourly
Mild-moderate infection (when enteral route unavailable)	5mg/kg 8 hourly	5mg/kg 6 hourly	3.75mg/kg (Max. dose 900mg) 6 hourly

Additional notes: The enteral bioavailability of clindamycin is excellent. Switch to enteral route as soon as the delivery and absorption is satisfactory.
For children weighing <2kg discuss with Pharmacy and Microbiology for intravenous dosing.

ENTERAL

Indication	0-13 days	14-28 days	>28 days
Severe infection	6mg/kg 8 hourly	6mg/kg 6 hourly	6mg/kg* (Max. dose 450mg) 6 hourly
Mild-moderate infection	3mg/kg 8 hourly	3mg/kg 6 hourly	3mg/kg (Max. dose 450mg) 6 hourly

Additional notes: *Doses up to 10mg/kg 6 hourly can be given safely via the enteral route but are seldom necessary. Enteral doses should be capped at 6mg/kg 6 hourly to maximise tolerability of antibiotic course.

Clindamycin suspension has poor palatability when given orally. Consider rounding dose to nearest whole capsule (75mg/ 150mg). Capsule can be opened, and contents can be sprinkled on food eg jam, yoghurt.

CO-AMOXICLAV

Drug class: Penicillin + beta-lactamase inhibitor (beta-lactam)

Dose adjustment: Renal impairment, severe hepatic impairment.

INTRAVENOUS Dosing is the cumulative total of amoxicillin and clavulanic acid based on a ratio of 5:1 respectively

Indication	<3 months	>3 months
All indications	30mg/kg 12 hourly	30mg/kg (Max. dose 1.2g) 8 hourly

ENTERAL

Indication	0-<1 month	1-<12 months	1-<6years	6-<12 years	≥12 years
All indications	0.25mL/kg 125/31 susp. 8 hourly	0.25 mL/kg* 125/31 susp. 8 hourly	5mL* 125/31 susp. 8 hourly	5mL* 250/62 susp. 8 hourly	1 tablet 500/125 tablet 8 hourly OR 10mL 250/62 susp. 8 hourly

Additional notes: Be aware of differing suspension strengths
If treating confirmed *Haemophilus influenzae* please refer to guideline Antimicrobial Highest Safe Dosing Guidance CAEC 1991
*Doses can be doubled in severe infections e.g. osteomyelitis (enteral switch) or when penetration to the infected organ is likely to be suboptimal e.g. bronchiectasis. However, do not exceed more than 15mg/kg/day clavulanic acid.

COLISTIN (*Colistimethate sodium)*

Drug class: Polymyxin

Dose adjustment: Renal impairment, obesity (discuss with Pharmacy)

INTRAVENOUS

Indication	<41kg	≥41kg
Severe infections (non-CF)	50,000 units/kg 8 hourly	3 million units 8 hourly

Additional notes: IV colistin is rarely indicated outside the cystic fibrosis setting (not covered by this guideline). Use will be guided by Microbiology or Infectious Diseases. Monitor renal function during treatment and avoid concomitant use of other nephrotoxic agents.

Therapeutic Drug Monitoring:
Therapeutic Drug Monitoring must occur in **all** patients receiving intravenous colistin.
Complete the first trough level after the patient has received at least 72 hours of intravenous treatment
Peak levels are not required.
Blood should **never** be taken from the cannula being used for dosing as this result in erroneous levels.
Monitor renal function carefully, especially if receiving other nephrotoxic agents.

NEBULISED *Colomycin*

Indication	All Ages
All indications (non-CF)	1 million units 12 hourly

CO-TRIMOXAZOLE (SEPTRIN)

Drug class: Combination of trimethoprim and sulfamethoxazole

Dose adjustment: Hepatic impairment, renal impairment

INTRAVENOUS Dosing is the cumulative total of trimethoprim and sulfamethoxazole based on a ratio of 1:5 respectively

Indication	**>6 weeks**
Treatment of *Pneumocystis jiroveci* pneumonia (PCP/PJP)	60mg/kg 12 hourly
All other indications	*18mg/kg (max. dose 960mg) 12 hourly

ENTERAL

Indication	**6 weeks-<6 months**	**6 months-<6 years**	**6-<14 years**	**≥14 years**
Treatment of *Pneumocystis jiroveci* pneumonia (PCP/PJP)	60mg/kg 12 hourly			
Indication	**6weeks-< 6 months**	**6 months-< 6 years**	**6-<12years**	**≥12 years**
All other indications	120mg 12 hourly	240mg 12 hourly	480mg 12 hourly	960mg 12 hourly

Additional notes:
If treating confirmed *Stenotrophomonas maltophilia* please refer to guideline Antimicrobial Highest Safe Dosing Guidance CAEC 1991
Co-trimoxazole can cause bone marrow suppression. Monitor full blood count on prolonged treatment.
Caution in G6PD deficiency.
Co-trimoxazole may be used in children <6 weeks of age for the treatment of, or prophylaxis for, PCP/PJP infection. Discuss with Pharmacy.
*Higher doses in non-PCP/PJP infection may be used in some severe infections, up to 27mg/kg (maximum dose 1.44g) 12 hourly. Discuss with Microbiology/Infectious Diseases/Pharmacy.

DOXYCYCLINE

Drug class: Tetracycline

Dose adjustment: Renal impairment

ENTERAL

Indication	**≥8 years up to <45kg**	**≥8 years and ≥45kg**
All indications	Loading dose: 4.4mg/kg once daily (max. dose 200mg) Then: 2.2mg/kg once daily (max. dose 100mg)*	Loading dose: 200mg once daily Then: 100mg once daily

Additional notes:
*Round dose to the nearest portion of a 100mg dispersible tablet to enable dosing.

To be given in age group 8-<12years under expert advice where no adequate alternatives exist (side effects from drug deposition on growing bones/teeth are minimal in this age group when short courses are used).

Can cause photosensitivity. Appropriate sun protection necessary during treatment minimum SPF30.

ERTAPENEM

Drug class: Carbapenem (beta-lactam)

Dose adjustment: Renal impairment

INTRAVENOUS

Indication	**3months – 12 years**	**>12 years**
All indications	15mg/kg (Max. dose 500mg) 12 hourly	1g 24 hourly

Additional notes: Ertapenem does not treat pseudomonal infections.
Not suitable for infections of the central nervous system.
Reduces sodium valproate levels – avoid concomitant use unless discussed with neurology team.

ERYTHROMYCIN

Drug class: Macrolide

Macrolides may cause QT prolongation.

Erythromycin has a poor side effect profile compared to other macrolide antibiotics. Consider use of azithromycin or clarithromycin instead (except when using for pro-kinetic effect).

Dose adjustment: renal impairment, obesity

INTRAVENOUS

Intravenous erythromycin is rarely indicated. Please discuss with Pharmacy and/or Microbiology.

ENTERAL

Indication	**<28 days**	**28 days – <2 year**	**2-<8 years**	**≥8 years**
Pro-kinetic indication	3mg/kg 6 hourly			3mg/kg 6 hourly (max. 250mg per dose)
All other indications	12.5mg/kg 6 hourly	250mg 12 hourly	500mg 12 hourly	1g 12 hourly

FLUCLOXACILLIN

Drug class: Penicillin

Dose adjustment: renal impairment

INTRAVENOUS

Indication	**<7 days**	**≥7-20 days**	**≥21 days**
Severe staphylococcal infections (& penetrate CNS)	50mg/kg 12 hourly	50mg/kg 8 hourly	50mg/kg (max. dose 2g) 6 hourly
Mild/moderate staphylococcal infections (when enteral route not available)	25mg/kg 12 hourly	25mg/kg 8 hourly	25mg/kg (max. dose 2g) 6 hourly

ENTERAL

Indication	<7 days	7-<21 days	21-<28 days	28 days – <2 year	2-<10 years	≥10 years
Mild/moderate staphylococcal infection	25mg/kg 12 hourly	25mg/kg 8 hourly	25mg/kg 6 hourly	125mg 6 hourly	250mg 6 hourly	500mg 6 hourly

Additional notes: Higher enteral doses may sometimes be recommended by Microbiology/ID Teams (doses up to 1g). Higher intravenous doses may be used in neonates with proven severe invasive infection caused by *Staphylococcus aureus*. Discuss with Microbiology/ID Team.
Flucloxacillin liquid is not palatable. It is recommended that one dose is given before discharge to ensure it will be tolerated.

FLUCONAZOLE

Drug class: Azole

Dose adjustment: Renal impairment

INTRAVENOUS

Indication	<14 days	14-28 days	>28 days
Candidaemia, Candida meningitis or intracranial infection	12mg/kg 72 hourly	12mg/kg 48 hourly	12 mg/kg (max. dose: 800mg) 24 hourly
All other indications	6mg/kg 72 hourly	6mg/kg 48 hourly	6 mg/kg (max. dose: 400mg) 24 hourly

ENTERAL

Indication	<14 days	14-28 days	>28 days
Mild mucosal Candidiasis (if topical treatment failed or inappropriate)	3mg/kg 72 hourly	3mg/kg 48 hourly	3mg/kg (max. dose: 100mg) 24 hourly
Candidaemia, Candida meningitis or intracranial infection (*see comment below)	12mg/kg 72 hourly	12mg/kg 48 hourly	12 mg/kg (max. dose: 800mg) 24 hourly
All other indications	6mg/kg 72 hourly	6mg/kg 48 hourly	6mg/kg (max. dose: 400mg) 24 hourly

Additional notes: Treatment of candidaemia, candida meningitis and Candida intracranial infections should initially be given intravenously in all cases. An oral switch to enteral fluconazole at the same dose may be possible when good clinical response has been demonstrated and following discussion with Microbiology or ID Teams.

Oral and IV dosing is the same

Fluconazole has a high number of drug-drug interactions

FUSIDIC ACID (SODIUM FUSIDATE)

Drug class: No other antibiotics in class. The active compound is available as two different preparations with different bioavailability – **they are not interchangeable**.

Dose adjustment: None required

TOPICAL (to the skin) ***PRESCRIBE AS FUSIDIC ACID***

Indication	**All ages**
Mild staphylococcal skin infections	Apply cream (2%) to infected area 6 hourly

Additional notes: Topical fusidic acid should only be used for very mild and localised staphylococcal skin infections. A maximum of 5 days treatment should be prescribed. Recurrent use should be avoided unless susceptibility to fusidic acid has been confirmed – resistance develops quickly.

INTRAVENOUS ***PRESCRIBE AS SODIUM FUSIDATE***

Indication	<50kg	≥50mg
All indications	7mg/kg 8 hourly	500mg 8 hourly

Additional notes: Rarely indicated. Occasionally used as an adjunct to other agents in the treatment of severe staphylococcal infections – use should be guided by Microbiology and/or Infectious Diseases.

Administration considerations: The diluted fluid should be infused via a central catheter over 2 hours. If to be infused via a peripheral catheter it must be given over 6 hours. Monitor insertion site for phlebitis.

ENTERAL

PRESCRIBE SUSPENSION AS FUSIDIC ACID ***PRESCRIBE TABLETS AS SODIUM FUSIDATE***

Indication	**<1 year**	**1-<5 years**	**5-<12 years**	**≥12 years**
All indications	**SUSPENSION** 15mg/kg 8 hourly	**SUSPENSION** 250mg 8 hourly	**SUSPENSION** 500mg 8 hourly	**SUSPENSION** 750mg 8 hourly **TABLETS** 500mg 8 hourly

GENTAMICIN

Drug class: Aminoglycoside

Dose impairment: renal impairment, obesity

INTRAVENOUS

	<7 days	**7-≤28 days**	**>28 days**
All indications	**GUIDE FOR 1st DOSE ONLY**		
	5mg/kg 36 hourly	5mg/kg 24 hourly	7mg/kg 24 hourly Max. dose 480mg

Additional notes: Refer to guideline CAEC893 for therapeutic drug monitoring requirements and dose alterations.
If patient has chronological age >28 days but gestational age <40 weeks speak to pharmacy about dosing.

ENTERAL

Gentamicin is not absorbed from the GI tract and cannot be given enterally for the treatment of infections. Enteral gentamicin may be used as part of a gut decontamination regimen in patients with bacterial overgrowth. Use for this indication should be instigated and monitored by the Gastroenterology team. See guideline CAEC 1770.

LINEZOLID

Drug class: Oxazolidone

Dose adjustment: Accumulation of metabolites in severe renal impairment

Use of linezolid should be discussed with a microbiologist or ID consultant.
Linezolid is a monoamine-oxidase inhibitor (MAOI). Concomitant use of other MAOIs and/or consumption of large quantities of tyramine-rich foods should be avoided due to the increased risk of serotonin syndrome. Interacts with selective serotonin reuptake inhibitors (SSRIs). Do not use concomitantly.
Can cause reversible myelosuppression, particularly if duration >14 days. Monitor full blood count weekly.
Optic neuropathy is a rare side effect in patients receiving >28 days. Patients should be warned to report visual symptoms. Use of linezolid for >28 days should, where possible, be avoided in children unable to report symptoms.

INTRAVENOUS

Indications	<7 days	7 days – <12 years	≥12 years
All indications	10mg/kg 12 hourly	10mg/kg (max. dose 600mg) 8 hourly	600mg 12 hourly

Additional notes: Patients who commence treatment on the parenteral formulation may be switched to enteral presentation if clinically indicated. In such circumstances, no dose adjustment is required as linezolid has an oral bioavailability of approximately 100%.

ENTERAL

Indications	<7 days	7 days – <12 years	≥12 years
All indications	10mg/kg 12 hourly	10mg/kg (max. dose 600mg) 8 hourly	600mg 12 hourly

Additional notes: Prescriber to be aware linezolid oral suspension is expensive and lacks palatability.
In ≥12 year prescribe tablet formulation, these can be crushed and dispersed in water for administration.

MEROPENEM

Drug class: Carbapenem (beta-lactam)

Dose adjustment: renal impairment

INTRAVENOUS

Indication	<7 days	7-28 days	>28 days
Sepsis, central nervous system (CNS) infections	40mg/kg 12 hourly	40mg/kg 8 hourly	40mg/kg (max. dose 2g) 8 hourly
Non-CNS infections	20mg/kg 12 hourly	20mg/kg 8 hourly	20mg/kg (max. dose 1g) 8 hourly

Additional notes: Reduces sodium valproate levels – avoid concomitant use unless discussed with neurology team.
CNS infection dosing may be recommended by Microbiology and/or ID team when organism has reduced susceptibility to meropenem (e.g. some carbapenemase producing enterobacteriacae (CPE+)).

METRONIDAZOLE

Drug class: Nitroimidazole

Dose adjustment: no dose adjustment necessary

INTRAVENOUS

Indication	**(26w-34w corrected gestational age)**	**(>34w corrected gestational age) - <2 months**	**>2 months**
All indications	Loading dose: 15mg/kg Then: 7.5mg/kg 12 hourly	Loading dose: 15mg/kg Then: 7.5mg/kg 8 hourly	7.5mg/kg (Max. dose: 500mg) 8 hourly **(no loading dose required)**

Additional note: Metronidazole has excellent enteral bioavailability. The IV formulation should only be used when enteral absorption is poor or uncertain.

ENTERAL

Indication	**<2 months**	**2 months – <12 years**	**≥12 years**
All indications (see below for *H. pylori* infection)	7.5mg/kg 12 hourly	7.5mg/kg (Max. dose: 400mg) 8 hourly	400mg 8 hourly

Additional note: Dosing in *H. pylori* infection varies depending on other components of combination therapy. Please refer to BNFc.

RECTAL

Indication	**1-<12 months**	**1-<5years**	**5-<10years**	**≥10 years**
All indications	125mg 8 hourly for 3 days Then 125mg 12 hourly	250mg 8 hourly for 3 days Then 250mg 12 hourly	500mg 8 hourly for 3 days Then 500mg 12 hourly	1g 8 hourly for 3 days Then 1g 12 hourly

Additional note: Metronidazole is readily absorbed from the rectal mucosa and widely distributed in body tissues

NITROFURANTOIN

Drug class: Nitrofuran

Dose adjustment: Renal impairment (see below)

ENTERAL

Indication	<3 months	≥3months – 11 years	≥12 years
Lower tract UTI	Contraindicated	750 micrograms/kg 6 hourly*	100mg 12 hourly Modified release preparation* OR 50mg 6 hourly immediate release preparation
UTI prophylaxis		1mg/kg Once daily, at night	100mg Once daily, at night

Additional note: Efficacy of the drug depends on renal secretion into the renal tract. No dose adjustment but avoid in children with an eGFR <45mL/minute.

* For children who can swallow tablets there is a modified release preparation available (dose: 100mg MR, 12 hourly) and this should be used in preference to the 50mg tablets.

Prescriber to be aware nitrofurantoin oral suspension is expensive and is sometimes difficult to obtain in the community for continued supply.

OSELTAMIVIR

Drug class: Neuraminidase inhibitors

Dose adjustment: Renal impairment

ENTERAL

Indication	<1 year	≥1 years (body weight 10-<16kg)	16-<24kg	24-<41kg	≥41kg
Treatment of Influenza	3mg/kg 12 hourly for 5 days	30mg 12 hourly for 5 days	45mg 12 hourly for 5 days	60mg 12 hourly for 5 days	75mg 12 hourly for 5 days
Prevention of Influenza	3mg/kg Once daily for 10 days	30mg Once daily for 10 days	45mg Once daily for 10 days	60mg Once daily for 10 days	75mg Once daily for 10 days

Additional note: For patients requiring intravenous treatment of influenza please see Zanamavir

For dosing of premature neonates <40 weeks corrected gestational age please contact pharmacy for dosing.

The oral suspension should be reserved for all patients <1 year. The appropriate strength capsule(s) (30mg, 45mg, 75mg) can be opened and the contents mixed with a small amount of sweetened food such as sugar water/chocolate syrup, just before administration.

Treatment may be extended to a 10-day course length in the immunocompromised.

PENICILLIN V (phenoxymethylpenicillin)

Drug class: Penicillin (beta-lactam)

Dose adjustment: Severe renal impairment

ENTERAL

Indication	1 month - <12 months	1-<6 years	6-<12 years	≥12 years
Tonsillitis/pharyngitis	62.5mg 6 hourly	125mg 6 hourly	250mg 6 hourly	500mg 6 hourly
Asplenia prophylaxis	62.5mg 12 hourly	125mg 12 hourly	250mg 12 hourly	
Prevention of rheumatic fever recurrence	125mg 12 hourly		250mg 12 hourly	

Additional note: Penicillin V is not a suitable enteral switch from benzylpenicillin apart from for the indications given above. Amoxicillin should be used in other scenarios.

PIPERACILLIN-TAZOBACTAM

Drug class: Penicillin + betalactamase inhibitor (beta-lactam)

Dose adjustment: Renal impairment

INTRAVENOUS

Indication	<28days	28 days – <12 years	≥12 years
Infections associated with neutropenia	90mg/kg 8 hourly	90mg/kg (max. dose: 4.5g) 6 hourly	4.5g 6 hourly
All other indications	90mg/kg 8 hourly	90mg/kg (max. dose: 4.5g) 8 hourly	4.5g 8 hourly

Additional note: If treating confirmed *Pseudomonas aeruginosa* please refer to guideline Antimicrobial Highest Safe Dosing Guidance CAEC 1991

PIVMECILLINAM

Drug class: Penicillin (beta-lactam)

Dose adjustment: Not required

ENTERAL

Indication	15-40kg	≥40kg
Uncomplicated UTI	(No loading dose) 200mg 8 hourly	Loading dose: 400mg Then: 200mg 8 hourly

Additional note: Only available preparation is a tablet.
Can crush and disperse tablet in a "neutral" fluid, avoid mixing with acidic juices. Poor palatability as can be very bitter.

Each pivmecillinam tablet must be taken with at least half a glass of water due to the risk of oesophageal ulceration.

RIFAMPICIN

Drug class: Rifamycin

Dose adjustment: Hepatic impairment, obesity

Rifampicin should never be used as monotherapy as resistance develops very rapidly.
Use for other indications (including tuberculosis) under direction of microbiology and/or ID team only.

INTRAVENOUS

Indication	**All ages**
Severe staphylococcal infection (adjunct agent)	10mg/kg (Max. dose: 600mg) 12 hourly

Additional note: Rifampicin has excellent enteral bioavailability. The IV formulation should only be used when enteral absorption is poor or uncertain.

ENTERAL

Indication	**All ages**
Staphylococcal infection (Adjunct agent)	10mg/kg (Max. dose: 600mg) 12 hourly

Additional note: Enteral formulations available include, suspension 100mg/5ml, 150mg capsules and 300mg capsules.

When administering rifampicin via enteral feeding tube use the suspension and mixed with equal parts of water.
Rifampicin is absorbed from the stomach and duodenum. There is therefore a risk of poor absorption if the drug is given through an enteral feeding tube terminating in the jejunum.

TEICOPLANIN

Drug class: Glycopeptide

Dose adjustment: renal impairment

INTRAVENOUS

Indication	**<2 months**	**2months – <12years**	**≥12 years**
All indications	Loading dose: 16mg/kg Then: 8mg/kg 24 hourly	Loading doses: 10mg/kg 12 hourly for 3 doses Then: 10mg/kg 24 hourly Maximum initial dose 800mg	Loading doses: 12mg/kg 12 hourly for 3 doses Then: 12mg/kg 24 hourly Maximum initial dose 800mg

Additional note: Therapeutic drug monitoring may be required for severe infections/those requiring a prolonged course of antibiotics/those at risk of toxicity.
Take a pre dose level on day 5 of therapy in those with normal renal function (pre 6th dose).

Dose reduction recommended in renal impairment (crcl <80ml/min/1.73m^2)
Standard dose to be used for the first three days and then adjusted on day four according to renal function.
Contact pharmacy for further support regarding dosing and therapeutic drug monitoring in these patients.

TOBRAMYCIN

Drug class: Aminoglycoside

Dose adjustment: Renal impairment, obesity

INTRAVENOUS

	<28 days*	>28 days
All indications (not CF)	5mg/kg 24 hourly	7mg/kg (maximum dose 24 hourly Maximum dose ≤10 years 320mg once daily Maximum dose >10 years 560mg once daily

Additional note:

Therapeutic Drug Monitoring:
Therapeutic Drug Monitoring must occur in all patients receiving tobramycin
A trough level must be completed prior to the second dose of tobramycin being given.
Peak levels are not required.
Blood should **never** be taken from the cannula being used for dosing as this result in erroneous levels.
Aiming for trough <1mg/L, do not wait for level to be reported before administering second dose.
*Discuss with pharmacy if corrected gestational age is <32 weeks.

TRIMETHOPRIM

Drug class: Dihydrofolate reductase inhibitor

Dose adjustment: Renal impairment

ENTERAL

Indication	<28 days	28 days – <12years	≥12 years
Treatment UTI	Loading dose: 3mg/kg Then: 2mg/kg 12 hourly	4mg/kg (max. dose: 200mg) 12 hourly	200mg 12 hourly
Prophylaxis UTI	2mg/kg 24 hourly, at night	2mg/kg (max. dose: 100mg) 24 hourly, at night	100mg 24 hourly, at night

VANCOMYCIN

Drug class: Glycopeptide

Dose adjustment: Renal impairment

INTRAVENOUS

Indications	**<28 days***	**1–<6 months**	**6–<12 months**	**1-<12 years**	**≥12 years**
Initial dosing for all indications	15mg/kg 8 hourly	10mg/kg 6 hourly	15mg/kg 6 hourly	17.5mg/kg (max. 750mg) every 6 hours	15mg/kg (max. 750mg) every 6 hours

Additional note: Therapeutic drug monitoring required. **Take first trough level pre 5th dose for those receiving 6 hourly dosing**. See Guidelines for Therapeutic Drug Monitoring (no. 1523).
If patient is less than 35 weeks corrected gestational age contact pharmacy for initial dose

*For patients transferred from Jessops on continuous vancomycin infusion:

1. Give total daily dose of continuous infusion as an intermittent infusion:

Corrected Gestational age	Intermittent infusion
<29 weeks CGA	12hourly
29+<35 weeks CGA	8hourly
≥35 weeks CGA	6hourly

2. Complete therapeutic drug monitoring after patient has received 24 hours of vancomycin intermittent dosing

ENTERAL

Indication	**>1 month**
Clostridium difficile infection	10mg/kg up to 125mg (max. dose in severe disease: 500mg) 6 hourly

Additional note: Vancomycin is not absorbed from the GI tract and systemic infections cannot be treating using the enteral route.
Therapeutic drug monitoring not required for patients on enteral vancomycin.

VORICONAZOLE

Drug class: Azole

Dose adjustment: Obesity, hepatic impairment, renal impairment*

INTRAVENOUS

Indication	1 month-<2 years	2-14 years (and <50kg)	2-14 years (and >50kg)	≥15 years
All indications	9mg/kg 12 hourly	Loading doses: 9mg/kg 12 hourly for 2 doses Then: 8mg/kg 12 hourly (Initial maximum dose 400mg)	Loading doses: 6mg/kg 12 hourly for 2 doses Then: 4mg/kg 12 hourly (Initial maximum dose 400mg)	Loading doses: 6mg/kg 12 hourly for 2 doses Then: 4mg/kg 12 hourly (Initial maximum dose 400mg)

Additional note:
Begin therapy using intravenous formulation.
When clinical stability established patient may be suitable for enteral switch
Enteral therapy is almost completely absorbed however in practise may not always give equivalent blood concentration levels (may be lower).
Prescribe the same dose and complete therapeutic drug monitoring.

ENTERAL

Indication	1 month - <2 years	2-14 years (and <50kg)	2-14 years (and ≥50kg)	≥15 years (<40kg)	≥15 years (≥40kg)
All indication	9mg/kg 12 hourly	9mg/kg 12 hourly (maximum 350mg/dose)	Loading doses: 400mg 12 hourly for 2 doses Then: 200mg 12 hourly	Loading doses: 200mg 12 hourly for 2 doses Then: 100mg 12 hourly	Loading doses: 400mg 12 hourly for 2 doses Then: 200mg 12 hourly

Additional note: Bioequivalence between the oral tablets and oral suspension has not been confirmed nor has it been excluded.

If switching between tablets and suspension, prescribe the same dose and complete therapeutic drug monitoring.

Therapeutic drug monitoring:
Therapeutic drug monitoring is vital for both intravenous and enteral dosing, to ensure serum levels achieved are both adequate and not toxic. **Interpatient variability is significant.** Voriconazole pharmacokinetics is non-linear and unpredictable, particularly in children <12 years

- Complete a trough level day 3-5 of treatment
- Continue to give voriconazole whilst waiting for the level unless there are clear clinical signs of voriconazole toxicity. Results available 48-72 working days after being sent.
- Target trough range: >2mg/L (>1mg/L acceptable when used for antifungal prophylaxis) and <5.5mg/\L
- Involve pharmacy in any discussions about subsequent dose adjustments

*****An additive in the IV formulation accumulates in renal impairment. For prolonged courses of voriconazole where an enteral preparation cannot be used additional monitoring may be required. Discuss with Pharmacy. Voriconazole has a high number of drug-drug interactions Due to a risk of visual disturbances, voriconazole should be used with caution in patients who are unable to have their vision assessed.

ZANAMIVIR		
Drug class: Neuraminidase inhibitors		
Dose adjustment: Renal impairment		
INTRAVENOUS		
Indication	6 months - <6 years	≥6 years – 18 years
Treatment of Influenza	14mg/kg 12 hourly	12mg/kg (max 600mg) 12 hourly
Additional note: Only to be prescribed under the advice of microbiology/virology		

Version Control:

Section	Date	Nature of change
Ceftriaxone	Feb 2024	Addition of note to avoid co-administration with calcium-containing IV solutions
Amoxicillin, ceftriaxone, cefotaxime, cefuroxime, ciprofloxacin, clindamycin, meropenem	Feb 2024	Addition of 'sepsis' as indication to support prescribing associated with Trust sepsis guideline

References

1. Alan Noel, Lead Principal Scientist, North Bristol NHS Trust, Ideal Colistin Pharmacokinetics, December 2022

2. Children's Antimicrobial Management Programme (ChAMP) Manual, Perth Children's Hospital, Tobramycin (intravenous) Monograph – Paediatric, Reviewed 2021 https://pch.health.wa.gov.au/ (online) [Accessed January 2023]

3. EMC Summary of Product Characteristics https://www.medicines.org.uk/emc [Accessed December 2022]

4. Evelina Paediatric Formulary, Stephen Tomlin, and Willam Thornhill at Guy's & St Thomas' NHS Foundation Trust [Accessed December 2022]

5. Hayward et al. 2018. Adverse effects of single dose of gentamicin in adults: a systematic review. British Journal of Pharmacology.

6. Jessops Neonatal Formulary [Accessed December 2022]

7. Lexi-Comp Online, Paediatric and Neonatal Lexi-Drugs Online, Hudson (OH) <http://online.lexi.com> [Accessed December 2022]

8. Martindale: The Complete Drug Reference (online) Alison Brayfield<http://www.medicinescomplete.com> [Accessed December 2022]

9. North Bristol NHS Trust, Antimicrobial Reference Laboratory, Guideline Ranges 2022 [Accessed December 2022]

10. Paediatric Antimicrobial Pharmacist Group UK. December 2022

11. Paediatric Formulary Committee. BNF for Children (online) London: BMJ Group, Pharmaceutical Press, and RCPCH Publications

12. Sheffield Children's NHS Foundation Trust, Drug Dosing in Renal and Hepatic Impairment 1980v1, January 2021 [Accessed December 2022]

13. Sheffield Children's NHS Foundation Trust, Drug Dosing in Renal and Hepatic Impairment 1980v1, January 2021 [Accessed December 2022]

14. Sheffield Children's NHS Foundation Trust, Drug dose adjustments in Obese Patients 1656v3, July 2019 [Accessed December 2022]

15. Sheffield Children's NHS Foundation Trust, Highest Safe Dosing Guidance CG1991, January 2021 [Accessed December 2022]

16. The John Hopkins POC-IT ABX Guide (online) John Hopkins University https://www.hopkinsguides.com/hopkins/ [Accessed December 2022]

17. The Renal Drug Database. https://renaldrugdatabase.com [Accessed December 2022]

18. Todd et al. No visible Dental Staining in Children treated with Doxycycline for Suspected Rocky Mountain Spotted Fever May 2015 (online) [Accessed December 2022]