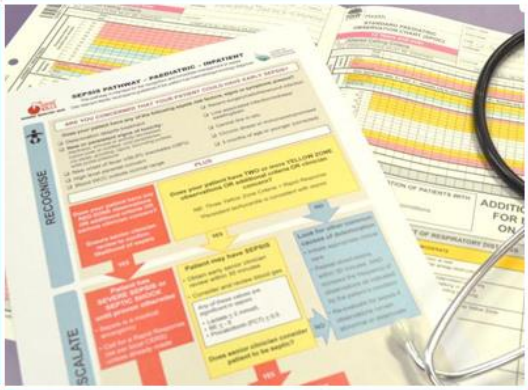
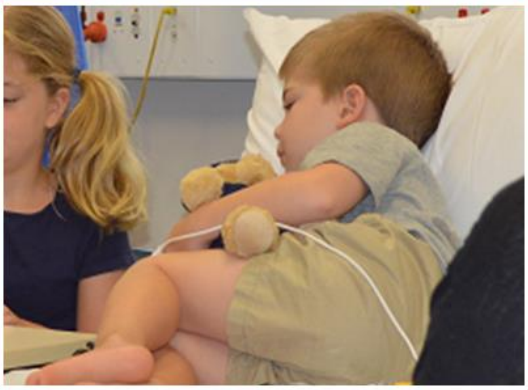
PAEDIATRIC

ANTIBIOTIC GUIDELINES FOR SEVERE SEPSIS & SEPTIC SHOCK & UNWELL NEONATES

REVISED JULY 2018





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DOCUMENT PURPOSE

The Clinical Excellence Commission's (CEC) *Paediatric Antibiotic Guidelines for Severe Sepsis & Septic Shock and Unwell Neonates* aims to guide the prescription and timely administration of antibiotics for **paediatric patients (29 days – 16 years) that have a diagnosis of severe sepsis or septic shock**, where the source is suspected or unknown and **unwell neonates (0-28 days).**

The guidelines are not intended for:

- Newborn babies associated with birth admission → use *Newborn Antibiotic Guideline for early and late onset of sepsis during birth episode of care*
- Premature neonates managed in specialised Neonatal Intensive Care Units (NICUs) with locally-endorsed antibiotic guidelines
- Paediatric patients with febrile neutropenia → use local febrile neutropenia guideline
- Paediatric patients with immunological conditions → consult with the patient's usual health service provider; if a delay is anticipated commence antibiotics according to this guideline with subsequent modification as appropriate
- Paediatric patients who DO NOT have severe sepsis or septic shock as defined above, but have sepsis or infection, either suspected or confirmed → use locally endorsed antibiotic prescribing guidelines e.g. *Therapeutic Guidelines: Antibiotic*
- Complex sources of sepsis such as necrotising fasciitis or sepsis from a suspected cardiac source, e.g. infective endocarditis → seek expert advice to determine therapy
- Paediatric patients who have been discharged from hospital in the last 7 days → seek expert advice to determine therapy

SEPSIS DEFINITIONS

Definitions of PAEDIATRIC sepsis[1]

SEPSIS	Infection, either suspected or confirmed, with systemic features such as fever, tachycardia, tachypnoea or elevated white cell count
SEVERE SEPSIS	Sepsis + organ dysfunction or hypoperfusion
SEPTIC SHOCK	Sepsis + hypotension despite adequate volume resuscitation

Definitions of NEONATAL sepsis [2, 3, 4]

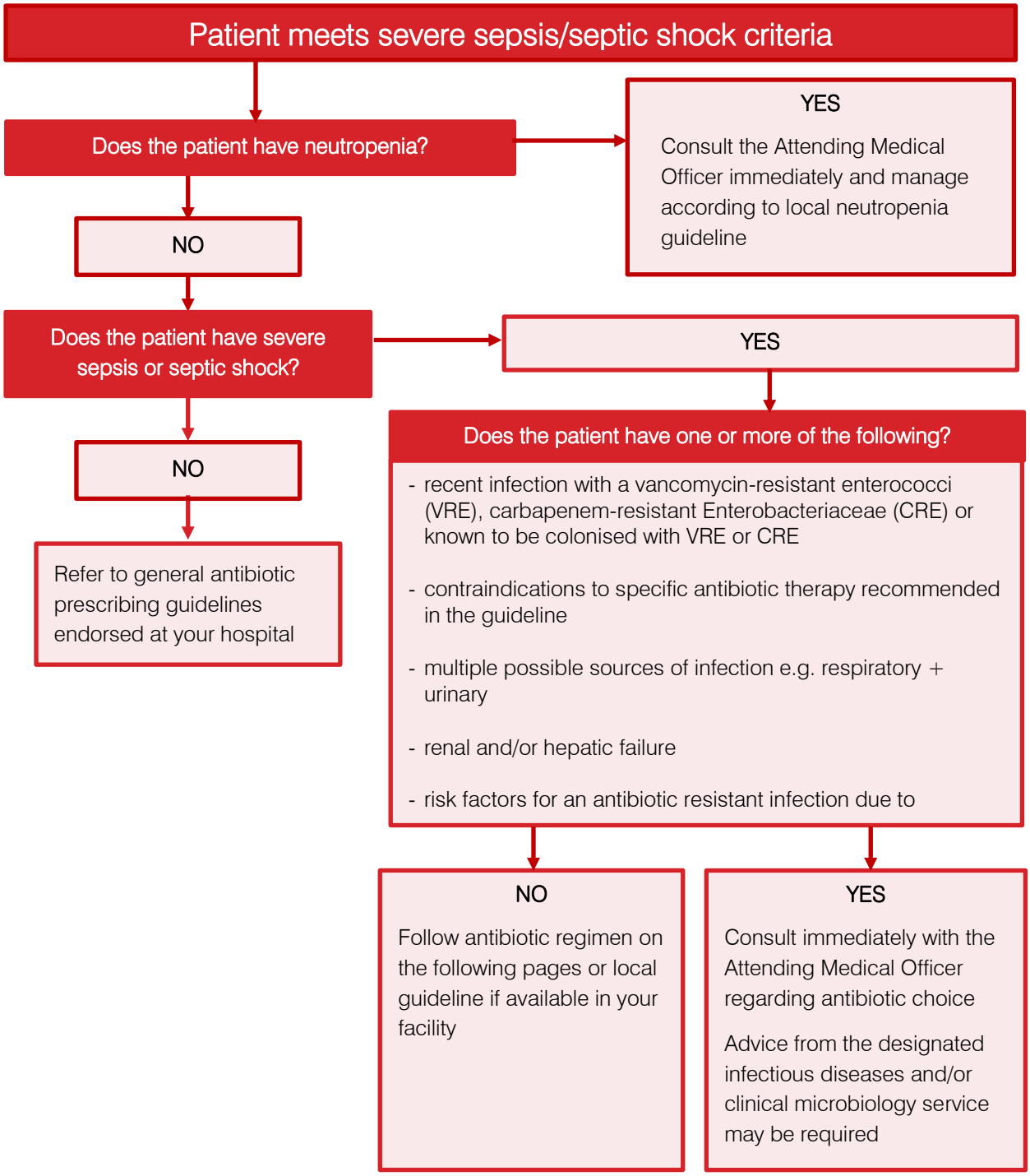
SEPSIS - early onset	Early-onset sepsis < 72 hours of age is associated with acquisition of microorganisms from the mother. The microorganisms most commonly associated with early-onset infection include the following: ▪ Group B Streptococcus ▪ *Escherichia coli* ▪ *Haemophilus influenzae* ▪ *Listeria monocytogenes* ▪ Herpes simplex virus
SEPSIS - late onset	Late-onset sepsis occurs ≥ 72 hours of age and may also be acquired from the caregiving environment. Organisms that have been implicated in causing late-onset sepsis include the following: ▪ Group B Streptococcus ▪ *Staphylococcus aureus* ▪ *Escherichia coli* ▪ Other Gram negative organisms ▪ Herpes simplex virus

IMPORTANT POINTS TO CONSIDER WHEN USING THE GUIDELINES

- The selection of appropriate antibiotic therapy is complex - these guidelines are not intended to cover all possible scenarios
- Prompt administration of antibiotics and resuscitation fluids is vital in the management of the patient with sepsis. In patients diagnosed with severe sepsis or septic shock, the goal is to commence antibiotic therapy within the first hour
- Obtain at least one set of blood cultures and other relevant clinical specimens e.g. urine, cerebrospinal fluid, wound swabs, PRIOR TO antibiotic commencement
- Do not delay antibiotic administration to wait for results of investigations
- If agents listed are not available in your hospital consult the Attending Medical Officer and/or seek expert advice as per local guidelines/policy
- A neonate presenting to the Emergency Department should be considered sick until proven otherwise
- For all infants aged less than 3 months consultation with a paediatric clinician is strongly recommended. This will vary according to the location and may include a general or specialist paediatrician, or a clinician experienced at least to the level of a paediatric registrar[5]
- Children must be bare weighed where possible to ensure correct dosage of medications
- Clinicians must document the indication, drug name, dose, route of administration and review date for antibiotics in the child's health care record
- The child and antibiotics should be reviewed by the treating team within 24 and 48 hours of commencement or once microbiology results are available. Antibiotics should be continued, changed or ceased as required - where necessary seek expert advice

PAEDIATRIC ANTIBIOTIC GUIDELINE FOR SEVERE SEPSIS & SEPTIC SHOCK

PAEDIATRIC ANTIBIOTIC GUIDELINE FOR SEVERE SEPSIS & SEPTIC SHOCK DECISION TREE



Further management:

The patient should be reviewed by the Attending Medical Officer within 24 - 48 hours of commencing the sepsis pathway and antibiotic therapy, with referral to the infectious diseases and/or clinical microbiology service for specific advice if required.

Clinicians who are experiencing difficulty in interpreting microbiology results when rationalising antibiotic therapy should contact the designated infectious diseases and/or clinical microbiology service.

INDICATION: PAEDIATRIC SEVERE SEPSIS (COMMUNITY OR HEALTHCARE-ASSOCIATED) DUE TO UNKNOWN SOURCE

(focus of infection not apparent)

ROUTE OF ADMINISTRATION	PENICILLIN ALLERGY STATUS		
	NO PENICILLIN ALLERGY	NON-IMMEDIATE PENICILLIN HYPERSENSITIVITY	IMMEDIATE PENICILLIN HYPERSENSITIVITY (or severe prior reaction)
Intravenous (IV) or intraosseous	cefotaxime 50 mg/kg up to 2 g, 6-hourly	cefotaxime 50 mg/kg up to 2 g, 6-hourly	ciprofloxacin 10 mg/kg up to 400 mg, 8-hourly
	PLUS	PLUS	PLUS
	gentamicin **[Note 1]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 1]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly
	PLUS	PLUS	
	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	
Intramuscular (IM) (should only be used in the short term until IV access established)	ceftriaxone 50 mg/kg up to 4 g, daily	ceftriaxone 50 mg/kg up to 4 g, daily	gentamicin **[Note 1]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily
	PLUS	PLUS	PLUS
	gentamicin **[Note 1]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 1]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily
	PLUS	PLUS	AND
	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily	seek expert advice
	AND	AND	
	seek expert advice	seek expert advice	

Note 1: In severe sepsis, gentamicin 7.5 mg/kg ideal body weight (IBW) is recommended.

INDICATION: PAEDIATRIC SEVERE SEPSIS SECONDARY TO COMMUNITY-ACQUIRED PNEUMONIA [Note 1]			
ROUTE OF ADMINISTRATION	PENICILLIN ALLERGY STATUS		
	NO PENICILLIN ALLERGY	NON-IMMEDIATE PENICILLIN HYPERSENSITIVITY	IMMEDIATE PENICILLIN HYPERSENSITIVITY (or severe prior reaction)
Intravenous (IV) or intraosseous	ceftriaxone 50 mg/kg up to 2 g, daily	ceftriaxone 50 mg/kg up to 2 g, daily	ciprofloxacin 10 mg/kg up to 400 mg, 8-hourly
	PLUS	**PLUS**	**PLUS**
	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly
	OR	**OR**	**OR**
	cefotaxime 50 mg/kg up to 2 g, 8-hourly	cefotaxime 50 mg/kg up to 2 g, 8-hourly	moxifloxacin 10 mg/kg up to 400 mg, daily
	PLUS	**PLUS**	
	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	
Intramuscular (IM) (should only be used in the short term until IV access established)	ceftriaxone 50 mg/kg up to 2 g, daily	ceftriaxone 50 mg/kg up to 2 g, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to 16 years of age:** maximum dose 560 mg, daily
	PLUS	**PLUS**	**PLUS**
	teicoplanin 10 mg/kg up to 400 mg,12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily	teicoplanin 10 mg/kg up to 400 mg,12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily	teicoplanin 10 mg/kg up to 400 mg,12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily
	AND seek expert advice	**AND** seek expert advice	**AND** seek expert advice

Note 1: If suspecting atypical pneumonia, ADD IV azithromycin 10mg/kg up to 500mg, IV daily

Note 2: In severe sepsis, gentamicin 7.5 mg/kg ideal body weight (IBW) is recommended

INDICATION: PAEDIATRIC SEVERE SEPSIS SECONDARY TO HOSPITAL-ACQUIRED PNEUMONIA
LOWER RISK OF MULTI-RESISTANT ORGANISMS (MRO) [Note 1] *If a gram-negative MRO is suspected, seek expert advice*

ROUTE OF ADMINISTRATION	PENICILLIN ALLERGY STATUS		
	NO PENICILLIN ALLERGY	NON-IMMEDIATE PENICILLIN HYPERSENSITIVITY	IMMEDIATE PENICILLIN HYPERSENSITIVITY (or severe prior reaction)
Intravenous (IV) or intraosseous	ceftriaxone 50 mg/kg up to 2 g, daily **PLUS** vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	ceftriaxone 50 mg/kg up to 2 g, daily **PLUS** vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to 16 years of age:** maximum dose 560 mg, daily **PLUS** vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly
	OR	**OR**	**OR**
	cefotaxime 50 mg/kg up to 2 g, 8-hourly **PLUS** vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	cefotaxime 50 mg/kg up to 2 g, 8-hourly **PLUS** vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	ciprofloxacin 10 mg/kg up to 400 mg, 8-hourly **PLUS** vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly
Intramuscular (IM) (should only be used in the short term until IV access established)	ceftriaxone 50 mg/kg up to 2 g, daily **AND** seek expert advice	ceftriaxone 50 mg/kg up to 2 g, daily **AND** seek expert advice	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to 16 years of age:** maximum dose 560 mg, daily **PLUS** teicoplanin 10 mg/kg up to 400 mg 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily **AND** seek expert advice

Note 1: Patients hospitalised in a low-risk ward (for any duration) or in a high-risk area (e.g.ICU or burns unit or other area with known higher incidence of MRSA acquisition) for less than 5 days should have therapy aimed at *Streptococcus pneumoniae* and non-MRO gram-negative bacilli as described above.

Note 2: In severe sepsis, gentamicin 7.5 mg/kg ideal body weight (IBW) is recommended.

INDICATION: PAEDIATRIC SEVERE SEPSIS SECONDARY TO HOSPITAL-ACQUIRED PNEUMONIA HIGHER RISK OF MULTI-RESISTANT ORGANISMS (MRO) [Note 1] *If a gram-negative MRO is suspected, seek expert advice*

ROUTE OF ADMINISTRATION	PENICILLIN ALLERGY STATUS		
	NO PENICILLIN ALLERGY	NON-IMMEDIATE PENICILLIN HYPERSENSITIVITY	IMMEDIATE PENICILLIN HYPERSENSITIVITY (or severe prior reaction)
Intravenous (IV) or intraosseous	piperacillin+tazobactam 100+12.5 mg/kg up to 4+0.5 g, 6-hourly **PLUS** vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly **OR** cefepime 50 mg/kg up to 2 g, 8-hourly **PLUS** vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	cefepime 50 mg/kg up to 2 g, 8-hourly **PLUS** vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to 16 years of age:** maximum dose 560 mg, daily **PLUS** vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly **OR** ciprofloxacin 10 mg/kg up to 400 mg, 8-hourly **PLUS** vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly
Intramuscular (IM) (should only be used in the short term until IV access established)	cefepime 50 mg/kg up to 2 g, 8-hourly **PLUS** teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily **AND** seek expert advice	cefepime 50 mg/kg up to 2 g, 8-hourly **PLUS** teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily **AND** seek expert advice	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to 16 years of age:** maximum dose 560 mg, daily **PLUS** teicoplanin 10 mg/kg up to 400 mg,12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily **AND** seek expert advice

Note 1: Patients hospitalised for 5 days or longer in high-risk areas have infections which are more likely to be caused by multi-resistant organisms. As survival is improved by early appropriate therapy, a broader-spectrum initial regimen is required.

Note 2: In severe sepsis, gentamicin 7.5 mg/kg ideal body weight (IBW) is recommended.

INDICATION: PAEDIATRIC SEVERE SEPSIS SECONDARY TO URINARY TRACT SOURCE

ROUTE OF ADMINISTRATION	PENICILLIN ALLERGY STATUS		
	NO PENICILLIN ALLERGY	NON-IMMEDIATE PENICILLIN HYPERSENSITIVITY	IMMEDIATE PENICILLIN HYPERSENSITIVITY (or severe prior reaction)
Intravenous (IV) or intraosseous	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to 16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to 16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to 16 years of age:** maximum dose 560 mg, daily
	PLUS	**If Group B streptococcus or enterococcal sepsis is known or suspected ADD**	**If Group B streptococcus or enterococcal sepsis is known or suspected ADD**
	amoxycillin/ampicillin 50 mg/kg up to 2 g, 6-hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly
	If extended spectrum beta (ß) lactamase (ESBL) producing organisms are known or suspected [Note 2]	**If extended spectrum beta (ß) lactamase (ESBL) producing organisms are known or suspected [Note 2]**	**If extended spectrum beta (ß) lactamase (ESBL) producing organisms are known or suspected [Note 2]**
	USE	**USE**	**USE**
	amikacin 30 mg/kg up to 1.25 g, daily	amikacin 30 mg/kg up to 1.25 g, daily	amikacin 30 mg/kg up to 1.25 g, daily
	OR	**OR**	
	meropenem 40 mg/kg up to 2g, 8-hourly	meropenem 40 mg/kg up to 2g, 8-hourly	
Intramuscular (IM) (should only be used in the short term until IV access established)	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to 16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to 16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to 16 years of age:** maximum dose 560 mg, daily
	PLUS	**PLUS**	**PLUS**
	amoxycillin/ampicillin 50 mg/kg up to 2 g, 6-hourly	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily
	AND seek expert advice		
		AND seek expert advice	**AND** seek expert advice

Note 1: In severe sepsis, gentamicin 7.5 mg/kg ideal body weight (IBW) is recommended.

Note 2: Risk factors for extended spectrum beta (ß) lactamase (ESBL) producing organisms include travel to Asia or the Indian subcontinent in the previous 6 months, prolonged hospitalisation, residence in a long term care facility, previous ESBL colonisation or infection, and broad spectrum cephalosporin or quinolone antibiotic use in the last month.

INDICATION: PAEDIATRIC SEVERE SEPSIS SECONDARY TO INTRA-ABDOMINAL SOURCE

ROUTE OF ADMINISTRATION	PENICILLIN ALLERGY STATUS		
	NO PENICILLIN ALLERGY	NON-IMMEDIATE PENICILLIN HYPERSENSITIVITY	IMMEDIATE PENICILLIN HYPERSENSITIVITY (or severe prior reaction)
Intravenous (IV) or intraosseous	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily
	PLUS	**PLUS**	**PLUS**
	amoxycillin/ampicillin 50 mg/kg up to 2 g, 6-hourly	vancomycin 15 mg/kg (actual body weight) up to 750 mg, 6-hourly	vancomycin 15 mg/kg (actual body weight) up to 750 mg, 6-hourly
	PLUS	**PLUS**	**PLUS**
	metronidazole 12.5 mg/kg up to 500 mg,12-hourly	metronidazole 12.5 mg/kg up to 500 mg,12-hourly	metronidazole 12.5 mg/kg up to 500 mg,12-hourly
Intramuscular (IM) (should only be used in the short term until IV access established)	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily
	PLUS	**PLUS**	**PLUS**
	amoxycillin/ampicillin 50 mg/kg up to 2 g, 6-hourly	clindamycin 15 mg/kg up to 600 mg, 8-hourly	clindamycin 15 mg/kg up to 600 mg, 8-hourly
	PLUS	**PLUS**	**PLUS**
	clindamycin 15 mg/kg up to 600 mg, 8-hourly	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily
	AND seek expert advice	**AND** seek expert advice	**AND** seek expert advice

Note 1: In severe sepsis, gentamicin 7.5 mg/kg ideal body weight (IBW) is recommended.

INDICATION: PAEDIATRIC SEVERE SEPSIS SECONDARY TO SKIN INFECTION

For patients with recent abdominal surgery or peritoneal wound, seek expert advice

ROUTE OF ADMINISTRATION	PENICILLIN ALLERGY STATUS		
	NO PENICILLIN ALLERGY	NON-IMMEDIATE PENICILLIN HYPERSENSITIVITY	IMMEDIATE PENICILLIN HYPERSENSITIVITY (or severe prior reaction)
Intravenous (IV) or intraosseous	flucloxacillin 50 mg/kg up to 2 g, 6-hourly	cephazolin 50 mg/kg up to 2 g, 8-hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly
	PLUS	**PLUS**	
	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	
	For infections related to fresh or sea water exposure ***ADD*** *ciprofloxacin 10 mg/kg up to 400 mg, 8-hourly*		
Intramuscular (IM) (should only be used in the short term until IV access established)	flucloxacillin 50 mg/kg up to 2 g, 6-hourly	cephazolin 50 mg/kg up to 2 g, 8-hourly	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily
	PLUS	**PLUS**	**AND** seek expert advice
	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily	
	AND seek expert advice	**AND** seek expert advice	

INDICATION: PAEDIATRIC SEVERE SEPSIS SECONDARY TO INTRAVASCULAR DEVICE SOURCE [Note 1]

Suspect IV device source when there is no other apparent focus for sepsis, even if there is no direct evidence of infection around the IV exit site. Early removal of the device is strongly recommended.

ROUTE OF ADMINISTRATION	PENICILLIN ALLERGY STATUS		
	NO PENICILLIN ALLERGY	NON-IMMEDIATE PENICILLIN HYPERSENSITIVITY	IMMEDIATE PENICILLIN HYPERSENSITIVITY (or severe prior reaction)
Intravenous (IV) or intraosseous	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily
	PLUS	**PLUS**	**PLUS**
	flucloxacillin 50 mg/kg up to 2 g, 6-hourly	cephazolin 50 mg/kg up to 2 g, 8-hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly
	PLUS	**PLUS**	
	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	
Intramuscular (IM) (should only be used in the short term until IV access established)	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily	gentamicin **[Note 2]** 7.5 mg/kg ideal body weight **1 month to 12 years of age:** maximum dose 320 mg, daily **12 to16 years of age:** maximum dose 560 mg, daily
	PLUS	**PLUS**	**PLUS**
	flucloxacillin 50 mg/kg up to 2 g, 6-hourly	cephazolin 50 mg/kg up to 2 g 8-hourly	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily
	PLUS	**PLUS**	
	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily	teicoplanin 10 mg/kg up to 400 mg, 12-hourly for 3 doses then 10 mg/kg up to 400 mg, daily	**AND** seek expert advice
	AND seek expert advice	**AND** seek expert advice	

Note 1: Intravascular devices may include venous access devices, permanent pacemakers or defibrillators, or endovascular prostheses such as stents.

Note 2: In severe sepsis, gentamicin 7.5 mg/kg ideal body weight (IBW) is recommended.

INDICATION: PAEDIATRIC SEVERE SEPSIS SECONDARY TO MENINGITIS/ENCEPHALITIS

ROUTE OF ADMINISTRATION	PENICILLIN ALLERGY STATUS		
	NO PENICILLIN ALLERGY	NON-IMMEDIATE PENICILLIN HYPERSENSITIVITY	IMMEDIATE PENICILLIN HYPERSENSITIVITY (or severe prior reaction)
Intravenous (IV) or intraosseous	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days
	PLUS	**PLUS**	**PLUS**
	ceftriaxone 50 mg/kg up to 2 g,12 hourly	ceftriaxone 50 mg/kg up to 2 g,12 hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly
	PLUS	**PLUS**	
	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	vancomycin 15 mg/kg actual body weight up to 750 mg, 6-hourly	**PLUS** ciprofloxacin 10mg/kg up to 400mg, 8 hourly
	OR	**OR**	**OR**
	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days
	PLUS	**PLUS**	**PLUS**
	cefotaxime 50 mg/kg up to 2 g, 6-hourly	cefotaxime 50 mg/kg up to 2 g, 6-hourly	moxifloxacin 10 mg/kg up to 400 mg, daily
	PLUS	**PLUS**	
	vancomycin 15 mg/kg (actual body weight) up to 750 mg, 6-hourly	vancomycin 15 mg/kg (actual body weight) up to 750 mg, 6-hourly	
	If signs of encephalitis **ADD 1 month – 5 years** aciclovir 20 mg/kg, 8-hourly. **5 years or older** aciclovir 15 mg/kg, 8-hourly		

Note 1: Do not give dexamethasone if serious concern of encephalitis.

INDICATION: PAEDIATRIC SEVERE SEPSIS SECONDARY TO MENINGITIS/ENCEPHALITIS continued

ROUTE OF ADMINISTRATION	PENICILLIN ALLERGY STATUS		
	NO PENICILLIN ALLERGY	NON-IMMEDIATE PENICILLIN HYPERSENSITIVITY	IMMEDIATE PENICILLIN HYPERSENSITIVITY (or severe prior reaction)
Intramuscular (IM) (should only be used in the short term until IV access established)	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg **[Note 2]**
	PLUS	**PLUS**	**AND** seek expert advice
	ceftriaxone 50 mg/kg up to 2 g,12-hourly **[Note 2]**	ceftriaxone 50 mg/kg up to 2 g,12-hourly **[Note 2]**	
	AND seek expert advice	**AND** seek expert advice	

Note 1: Do not give dexamethasone if serious concern of encephalitis.

Note 2: Once Intravenous or intraosseous access has been obtained give vancomycin 15 mg/kg (actual body weight) up to 750 mg, 6-hourly.

NOTES FOR PAEDIATRIC ANTIBIOTIC PRESCRIBING

Definitions of penicillin hypersensitivity	**Immediate hypersensitivity** involves the development of urticaria, angioedema, bronchospasm or anaphylaxis within one to two hours of drug administration. **Non-immediate hypersensitivity** is characterised by macular, papular or morbilliform rash, occurring several days after starting treatment. They are more common than immediate reactions and may be caused by the infection or its treatment. **Severe prior reaction** involves a history of drug rash eosinophilia and systemic symptoms (DRESS) or Stevens-Johnson Syndrome following administration of a penicillin or cephalosporin. All penicillin and cephalosporin class antibiotics are contraindicated in patients with history of DRESS, Stevens-Johnson Syndrome or IgE-mediated immediate penicillin or cephalosporin allergy. Refer to *Therapeutic Guidelines: Antibiotic* for more information on antimicrobial hypersensitivity .
Definitions of lower risk and higher risk of Multidrug Resistant Organisms (MRO)	Refer to *Therapeutic Guidelines: Antibiotic* for more information: Hospital-acquired pneumonia: lower risk of multidrug-resistant organisms Hospital-acquired pneumonia: higher risk of multidrug-resistant organisms
Vancomycin dosing and frequency	Refer to *Therapeutic Guidelines: Antibiotic* for more information: Vancomycin dosing and frequency
Gentamicin dosing and frequency	**Contraindications**: • Previous vestibular or auditory toxicity due to an aminoglycoside • Serious hypersensitivity reaction to an aminoglycoside • Myasthenia gravis **Precautions:** • Pre-existing significant hearing problems • Pre-existing vestibular problems • Family history (first-degree relative) of auditory toxicity caused by an aminoglycoside • Chronic renal impairment (creatinine clearance less than 40 mL/min) or rapidly deteriorating renal function – consult AMO Refer to *Therapeutic Guidelines: Antibiotic* for more information: Gentamicin dosing and frequency Dose should be based on ideal body weight using locally endorsed guidelines. **Precautions must be taken with creatinine clearance <60 mL/min 4-5mg/kg (IBW) recommended: see *Therapeutic Guidelines: Antibiotic* or seek expert advice.** Lower doses are recommended for patients that are not critically ill. Refer to the antibiotic prescribing guidelines endorsed in your facility. One dose of gentamicin is recommended; for subsequent doses, assess renal function and adjust frequency accordingly. Use for a maximum of 48 hours as empirical therapy pending outcome of investigations; monitoring of plasma concentrations NOT required if gentamicin is not used beyond 48 hours. Directed therapy (beyond 48 hours, based on microbiology results) should be used on the advice of infectious diseases physician or clinical microbiologist only.

PAEDIATRIC MEDICATION ADMINISTRATION

Adapted with permission from The Children's Hospital at Westmead Paediatric Injectable Medicines Handbook

- From a microbiological perspective, injectable medication **must be prepared immediately prior to administration** using aseptic technique
- Reconstitute antibiotics with sterile water for injection (WFI) unless stated otherwise in the table below
- Displacement volume is the volume that the powder component of a drug takes up upon reconstitution. It needs to be added to the diluent volume to ensure accuracy when calculating doses that are less than a full vial. Thus the diluent volume recommended in the Product Information (PI) may sometimes differ from the volume recommended in this guideline. The displacement volume provided is an estimate and this may vary between brands. Please check in the Product Information or with the manufacturer

volume of diluent to reconstitute a vial + displacement volume of drug powder = final volume of vial

- If further dilution is required for IV injection or infusion, use sterile sodium chloride 0.9% or sterile glucose 5% unless stated otherwise.
- Where possible use separate dedicated lines for resuscitation fluid and for medications. When injecting antibiotics directly into an IV injection port which has resuscitation fluid running:
  - clamp the infusion fluid line and flush with 20 mL sterile sodium chloride 0.9% solution
  - administer antibiotic over the required time
  - flush the line with 20 mL sterile sodium chloride 0.9% solution and recommence resuscitation fluid

Medication PAEDIATRIC	Availability	Reconstitution fluid/volume	Administration	Notes
aciclovir	Powdered vial 250 mg, 500 mg	250 mg powdered vial: Add 10 mL water for injection = 25 mg/mL 500 mg powdered vial: Add 20 mL water for injection = 25 mg/mL	**Intermittent IV infusion:** Dilute to 5 mg/mL, infuse over at least 60 minutes	**Do NOT give as a bolus IV injection or intramuscularly** Avoid extravasation, highly alkaline, rotate infusion sites Discard solution if visible turbidity or crystallisation occurs
	Ampoule or vial 250 mg in 10 mL or 500 mg in 20 mL	Reconstitution not required		

Medication PAEDIATRIC	Availability	Reconstitution fluid/volume	Administration	Notes
amikacin	Vial 500 mg in 2 mL	Reconstitution not required = 250 mg/mL	**Intermittent IV infusion:** Dilute with sodium chloride 0.9% to a maximum concentration of 10 mg/mL, infuse over 30 to 60 minutes	**Do NOT give as a bolus IV injection** Daily dosing trough <5 mg/L (pre-dose), peak not required; monitor serum levels after 72 hours Observe for neuromuscular blockade or paralysis Adjust in renal failure - potential for ototoxicity and nephrotoxicity
			IM injection: Inject undiluted into a large muscle	
amoxycillin	Vial 500mg, 1g	500 mg vial: Add 4.6 mL water for injection = 100 mg/mL	**IV injection:** Dilute to a maximum concentration of 50 mg/mL, doses less than or equal to 30mg/kg, inject over at least 3 to 4 minutes	Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporin antibiotics Rapid IV administration may cause seizures Do NOT administer if reconstituted solution is pink **Do NOT administer lignocaine solution intravenously**
		1g vial: Add 9.2 mL water for injection = 100 mg/mL	**Intermittent IV infusion**: Doses higher than 30 mg/kg, infuse over 30 minutes	
		IM solution: water for injection or lignocaine 1% 500mg vial: Add 2.6 mL = 167 mg/mL	**IM injection:** Inject deep into a large muscle, divide doses larger than 500 mg between multiple injection sites	
		1 g vial: Add: 5.2 mL = 167mg/mL		
ampicillin	Vial 500 mg, 1g	IV or IM solution 500 mg vial: Add 1.7 mL water for injection = 250 mg/mL	**IV injection:** Doses less than 30 mg/kg or 500 mg dilute to 50-100 mg/mL using sodium chloride 0.9%, inject over at least 3 to 5 minutes	Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporin antibiotics Rapid IV administration may cause seizures
		1 g vial: Add 3.3 mL water for injection= 250 mg/mL	**Intermittent IV infusion**: Doses greater than 30 mg/kg or 500 mg dilute to a maximum concentration of 30 mg/mL, infuse over 15 to 30 minutes	
			IM injection: Inject deep into a large muscle, divide doses larger than 500 mg between multiple injection sites	

Medication PAEDIATRIC	Availability	Reconstitution fluid/volume	Administration	Notes
azithromycin	Vial 500 mg	500 mg vial: Add 4.8 mL water for injection = 100 mg/mL	**Intermittent IV infusion:** Dilute to 2 mg/mL and infuse over 1 hour	**Do NOT give as a bolus IV injection or intramuscularly** Severe allergic reactions may occur
cefepime	Vial 1 g, 2 g	1 g vial: Add 8.7 mL sodium chloride 0.9% = 100 mg/mL	**IV injection:** Inject 100mg/mL slowly over 3 to 5 minutes	Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporin antibiotics Pain or phlebitis may occur at the injection site Although rare, anaphylactic reactions may require immediate emergency treatment. Contains L-arginine as a buffer **Do NOT administer lignocaine solution intravenously**
		2 g vial: Add 17.4 mL sodium chloride 0.9% = 100 mg/mL	**Intermittent IV infusion:** Dilute to a maximum concentration of 40 mg/mL, infuse over 20 to 30 minutes	
		IM solution: Water for injection or lignocaine 1% 1 g vial: Add 2.3 mL = 280 mg/mL	**IM injection:** Inject deep into a large muscle	
cefotaxime	Vial 500 mg, 1 g, 2 g	500 mg vial: Add 4.8 mL water for injection = 100 mg/mL	**IV injection:** Inject slowly over 3 to 5 minutes	Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporin antibiotics[4] If IM is required ceftriaxone once a day is preferred Avoid rapid injection (<1 minute) due to association with arrhythmias **Do NOT administer lignocaine solution intravenously**
		1 g vial: Add 4.6 mL water for injection = 200 mg/mL	**Intermittent IV infusion:** Dilute to a maximum concentration of 40 mg/mL using sodium chloride 0.9%, infuse over 15 to 30 minutes	
		2 g vial: Add 9 mL water for injection = 200 mg/mL		
		IM solution: water for injection or 0.5% or 1% lignocaine 500 mg vial: Add 2 mL = 230 mg/mL 1 g vial: Add 3 mL = 300 mg/mL 2 g vial: Add 5 mL = 330 mg/mL	**IM injection:** Inject deep into gluteus muscle Large doses of 2 g should be divided between two different sites Do NOT inject more than 2 g/day or more than 4 mL into either buttock	

Medication PAEDIATRIC	Availability	Reconstitution fluid/volume	Administration	Notes
ceftriaxone	Vial 500 mg, 1 g, 2 g	500 mg vial: Add 4.8 mL water for injection = 100 mg/mL	**Intermittent IV infusion:** (preferred administration method) Dilute to a maximum concentration of 40 mg/mL using sodium chloride 0.9 %, infuse over 30 minutes	Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporin antibiotics[4] Do NOT reconstitute with sodium chloride 0.9% as this may form fine grade crystals that are easily overlooked Must not be administered simultaneously with IV calcium-containing products but may be administered sequentially, provided the infusion lines are thoroughly flushed between infusions with sodium chloride 0.9% **Do NOT administer lignocaine solution intravenously**
		1 g vial: Add 9.6 mL water for injection = 100 mg/mL	**IV injection:** Dilute doses less than 1 g to a maximum concentration of 40 mg/mL using sodium chloride 0.9%, inject slowly over 2 to 4 minutes	
		2 g vial: Add 19.2 mL water for injection = 100 mg/mL		
		IM solution: Add Lignocaine 1% 500 mg vial: Add 1.8 mL = 250 mg/mL 1 g vial: Add 2.5 mL = 350 mg/mL	**IM injection:** Inject deep into a large muscle, divide doses over 1 g between more than one site	
cephazolin	Vial 500 mg, 1 g, 2 g Infusion bottles 2 g	500 mg vial: Add 4.8 mL water for injection = 100 mg/mL	**IV injection:** Inject slowly over 3 to 5 minutes Fluid-restricted patients: maximum concentration of 138 mg/mL in water for injection.	Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporin antibiotics Do NOT reconstitute with sodium chloride 0.9% as this may form fine grade crystals that are easily overlooked **Do NOT administer lignocaine solution intravenously**
		1g vial: Add 9.5 mL water for injection = 100 mg/mL	**Intermittent IV infusion:** Dilute to a maximum concentration of 20 mg/mL, infuse over 10 to 60 minutes	
		IM solution: water for injection or lignocaine 0.5% 500 mg vial: Add 2 mL = 225 mg/mL 1 g vial: Add 2.5 mL = 330 mg/mL	**IM injection:** Inject deep into a large muscle	

Medication PAEDIATRIC	Availability	Reconstitution fluid/volume	Administration	Notes
ciprofloxacin	Infusion bag/vial 100 mg in 50 mL 200 mg in 100 mL 400 mg in 200 mL	Reconstitution not required = 2 mg/mL	**Intermittent IV infusion:** Infuse slowly into a large vein over 60 minutes	**Do NOT give as a bolus IV injection or intramuscularly** Avoid extravasation Monitor for possible infusion site reactions like thrombophlebitis and erythema
clindamycin	Ampoule 300 mg in 2 mL 600mg in 4 mL	Reconstitution not required = 150 mg/mL	**Intermittent IV infusion:** Dilute to a maximum concentration of 18 mg/mL in sodium chloride 0.9% and infuse over 10 to 60 minutes Maximum rate is 30 mg/minute	Hypotension and cardiopulmonary arrest may occur if given by rapid IV bolus Can cause local irritation, pain and thrombophlebitis on administration
			IM injection: Deep IM injection; rotate sites, do not exceed 600 mg in a single injection	IM injection may cause pain, induration and sterile abscess
dexamethasone	Ampoule 4 mg in 1 mL 8mg in 2mL	Reconstitution not required = 4 mg/mL	**IV injection:** Inject undiluted or diluted slowly over 1 to 4 minutes	Avoid rapid injection IV injection is associated with burning or tingling in the perianal area
			Intermittent IV infusion: Dilute high doses in 100 mL and infuse over at least 15 to 30 minutes	
			IM injection: Inject undiluted into a large muscle	
flucloxacillin	Vial 500 mg, 1 g	500 mg vial: Add 4.6 mL water for injection = 100 mg/mL	Doses greater than 25 mg/kg should be infused to avoid phlebitis **IV injection:** Dilute to a maximum concentration of 50 mg/mL and inject slowly over 3 to 5 minutes	Avoid extravasation Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporin antibiotics
		1 g vial: Add 4.3 mL water for injection = 200 mg/mL	**Intermittent IV infusion:** Dilute in 50–100mL infuse over 30 to 60 minutes	Flush line well between giving IV flucloxacillin and IV aminoglycoside antibiotics
		IM solution: water for injection or lignocaine 0.5% or 1% 500 mg vial: Add 1.6 mL = 250 mg/mL 1 g vial: Add 4.3 mL = 250 mg/mL	**IM injection:** Inject slowly into a large muscle	**Do NOT administer lignocaine solution intravenously** Injection site reactions include pain after IM injection

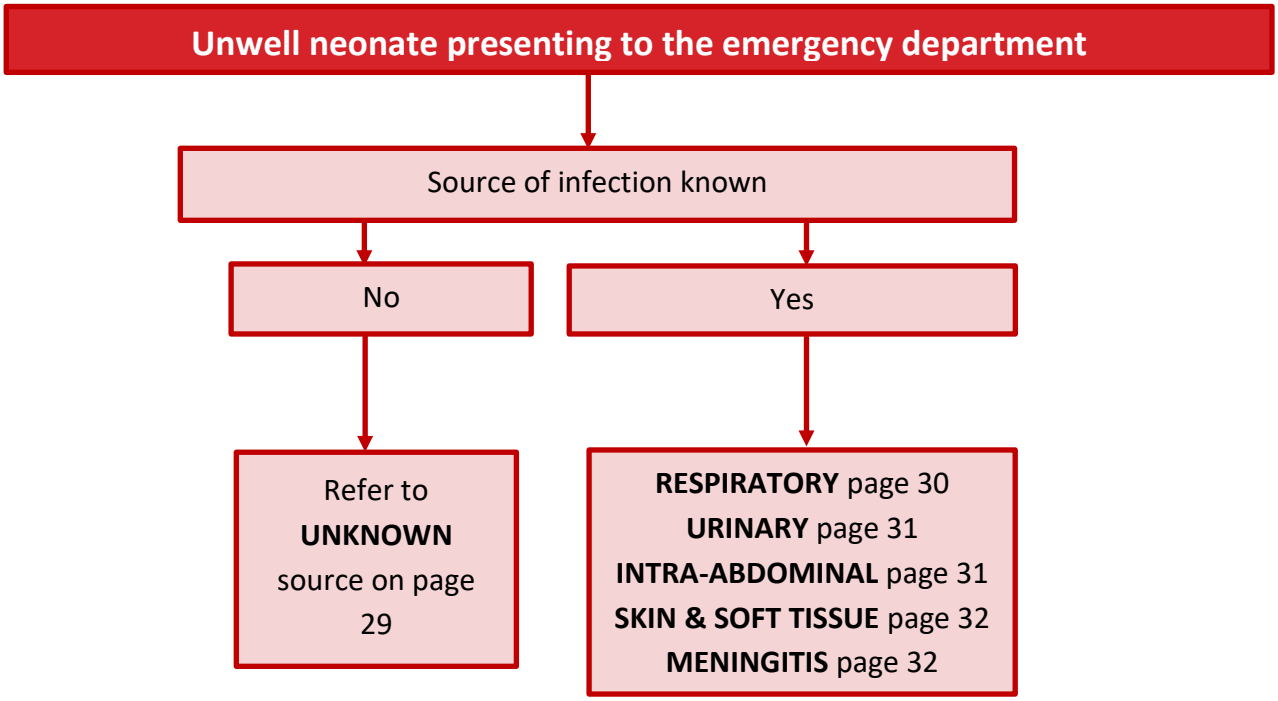
Medication PAEDIATRIC	Availability	Reconstitution fluid/volume	Administration	Notes
gentamicin	Ampoule 10 mg in 1 mL 40 mg in 1 mL 60 mg in 1.5 mL 80 mg in 2 mL	Reconstitution not required	**IV injection:** If dose is less than 20 mg dilute to 5 mL; if greater than 20 mg dilute to 10 mL, inject slowly over 3 to 5 minutes. **Intermittent IV infusion:** Dilute to 1 mg/mL and infuse over 30 minutes, maximum concentration:10 mg/mL **IM injection:** Administer undiluted via deep injection into a large muscle, IV route is preferred	Flush the line well before and after giving penicillins and cephalosporins In patients with renal impairment, separate the drugs by several hours Monitor gentamicin blood levels
meropenem	Vial 500 mg,1 g	500mg vial: Add 9.6 mL water for injection = 50 mg/mL 1g vial: Add 19.1 mL water for injection = 50 mg/mL	**IV injection:** Inject undiluted slowly over 5 minutes **Intermittent IV infusion:** Dilute and infuse over 15 to 30 minutes Maximum concentration: 50 mg/mL	**Do NOT give intramuscularly** Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporin antibiotics Modify dose in renal impairment Observe for pain or burning at injection site (can cause thrombophlebitis) and hypersensitivity
metronidazole	Infusion bag 500 mg in 100 mL	Reconstitution not required	**Intermittent IV infusion:** Infuse undiluted or diluted to 1 mg/mL or more, over 20 to 30 minutes Maximum rate: 25 mg/minute	**Do NOT give intramuscularly** Discard solution if cloudy or precipitated Avoid contact of metronidazole solution with equipment containing aluminium
moxifloxacin	Infusion bag 400 mg in 250 mL	Reconstitution not required	**Intermittent IV infusion:** Infuse undiluted over 60 minutes	**Do NOT give as a bolus IV injection or intramuscularly** May prolong QT interval and decrease seizure threshold in epilepsy
piperacillin + tazobactam	Vial piperacillin 4 g + tazobactam 500 mg (4.5 g)	4.5 g vial: Add 16.8 mL water for injection = 200 mg/mL piperacillin	Doses and rates are of piperacillin component unless otherwise specified **Intermittent IV infusion:** Dilute to a maximum concentration of 20 mg/mL, infuse over 30 minutes Maximum concentration 200 mg/mL in critical care areas	**Do NOT give as a bolus IV injection or intramuscularly** Avoid extravasation Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporins

Medication PAEDIATRIC	Availability	Reconstitution fluid/volume	Administration	Notes
teicoplanin	Vial 400 mg + water for injection diluent	Add entire ampoule of water for injection diluent supplied = 400 mg/3 mL =133 mg/mL Do not shake when mixing, roll gently avoiding foam formation	IV injection: Give undiluted or diluted and inject slowly over 5 minutes Intermittent IV infusion: Dilute to a convenient volume and infuse over 30 minutes IM injection: Inject no more than 400 mg/3 mL at a single site	Caution: cross sensitivity may occur in patients with a history of hypersensitivity to vancomycin, but is not a contraindication
vancomycin	Vial 500 mg, 1g	500 mg vial: Add 10 mL water for injection = 50 mg/mL 1g vial: Add 20 mL water for injection = 50 mg/mL	Intermittent IV infusion: Dilute to a maximum concentration of 5 mg/mL, infuse over 60 minutes Maximum rate: 10 mg/minute for doses over 500 mg Fluid restricted patients: maximum concentration of 10 mg/mL via a central venous line If symptoms of 'red man syndrome' occur, extend the infusion time to 120 minutes or more	Do NOT give as a bolus IV injection or intramuscularly Avoid extravasation Rapid infusion (< 60 minutes) may cause 'red man syndrome' with flushing or rash and rarely hypotension requiring the infusion to be slowed and close monitoring Caution: cross sensitivity may occur in patients with a history of hypersensitivity to teicoplanin. Monitor serum trough levels for ongoing doses

ANTIBIOTIC GUIDELINE FOR UNWELL NEONATES

PRESENTING TO THE EMERGENCY DEPARTMENT

ANTIBIOTIC GUIDELINE FOR UNWELL NEONATES PRESENTING TO THE EMERGENCY DEPARTMENT DECISION TREE



Further management:

A neonate presenting to the Emergency Department should be considered sick until proven otherwise. For all infants aged less than 3 months consultation with a paediatric clinician is strongly recommended.5 If paediatric clinician not available call NETS NSW phone 1300 36 2500 for urgent advice.

The neonate must be reviewed by the Attending Medical Officer within 24 - 48 hours of commencing the sepsis pathway and antibiotic therapy, with referral to the infectious diseases and/or clinical microbiology service for specific advice if required. The management plan should be communicated to the Senior Medical Officer, Midwife/Nurse in Charge, and the neonate's family/carers.

Clinicians who are experiencing difficulty in interpreting microbiology results when rationalising antibiotic therapy should contact the designated infectious diseases and/or clinical microbiology service.

INDICATION: TERM NEONATE - UNKNOWN SOURCE *seek expert advice for preterm neonate*	
ROUTE OF ADMINISTRATION	
INTRAVENOUS (IV)	INTRAMUSCULAR (IM) *Should only be used in the short term until IV access established*
cefotaxime 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 8-hourly 8-28 days old, 6-8 hourly	cefotaxime 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 8-hourly 8-28 days old, 6-8 hourly
PLUS	PLUS
vancomycin 15 mg/kg (maximum single dose, 90 mg) 0-7 days old, 12-hourly 7-28 days old, 8-hourly	teicoplanin 16 mg/kg 24 hourly on day 1, then 8 mg/kg 24-hourly (maximum single dose, 80 mg)
PLUS	PLUS
gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]	gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]
If herpes is known or suspected ADD Aciclovir 20 mg/kg, 8-hourly (maximum single dose, 100 mg)	*If herpes is known or suspected* SEEK EXPERT ADVICE
Note 1: Refer to Neonatal Medicines Formulary Consensus Group http://www.seslhd.health.nsw.gov.au/rhw/Newborn_Care/guidelines_med.asp for ongoing monitoring	

INDICATION: TERM NEONATE – SEVERE PNEUMONIA ($SaO_2 \leq 90\%$) *seek expert advice for preterm neonate*

ROUTE OF ADMINISTRATION	
INTRAVENOUS (IV)	INTRAMUSCULAR (IM) *Should only be used in the short term until IV access established*
cefotaxime 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 8-hourly 8-28 days old, 6-8 hourly	cefotaxime 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 8-hourly 8-28 days old, 6-8 hourly
PLUS	PLUS
gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]	gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]
Note 1: Refer to Neonatal Medicines Formulary Consensus Group http://www.seslhd.health.nsw.gov.au/rhw/Newborn_Care/guidelines_med.asp for ongoing monitoring	

INDICATION: TERM NEONATE – PNEUMONIA *seek expert advice for preterm neonate*

ROUTE OF ADMINISTRATION	
INTRAVENOUS (IV)	INTRAMUSCULAR (IM) *Should only be used in the short term until IV access established*
benzylpenicillin 60 mg/kg (maximum single dose, 300 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly	benzylpenicillin 60 mg/kg (maximum single dose, 300 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly
PLUS	PLUS
gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]	gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]
OR	OR
ampicillin 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly	ampicillin 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly
PLUS	PLUS
gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]	gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]
Note 1: Refer to Neonatal Medicines Formulary Consensus Group http://www.seslhd.health.nsw.gov.au/rhw/Newborn_Care/guidelines_med.asp for ongoing monitoring	

INDICATION: TERM NEONATE – URINARY SOURCE *seek expert advice for preterm neonate*

ROUTE OF ADMINISTRATION	
INTRAVENOUS (IV)	INTRAMUSCULAR (IM) *Should only be used in the short term until IV access established*
ampicillin 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly	ampicillin 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly
PLUS	PLUS
gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]	gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]
Note 1: Refer to Neonatal Medicines Formulary Consensus Group http://www.seslhd.health.nsw.gov.au/rhw/Newborn_Care/guidelines_med.asp for ongoing monitoring	

INDICATION: TERM NEONATE – INTRA-ABDOMINAL SOURCE *seek expert advice for preterm neonate*

ROUTE OF ADMINISTRATION	
INTRAVENOUS (IV)	INTRAMUSCULAR (IM) *Should only be used in the short term until IV access established*
ampicillin 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly	ampicillin 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly
PLUS	PLUS
gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]	gentamicin 5 mg/kg, daily (maximum single dose, 25 mg) [Note 1]
PLUS	PLUS
metronidazole 15 mg/kg as a loading dose then subsequent doses of: 7.5 mg/kg 0-7 days old, 8-hourly 7.5 mg/kg 8-28 days old, 6-hourly	clindamycin 5mg/kg/dose (maximum dose 25 mg) 0-7 days old, 8-hourly 8-28 days old, 6-hourly
Note 1: Refer to Neonatal Medicines Formulary Consensus Group http://www.seslhd.health.nsw.gov.au/rhw/Newborn_Care/guidelines_med.asp for ongoing monitoring	

INDICATION: TERM NEONATE – SKIN & SOFT TISSUE SOURCE *seek expert advice for preterm neonate*

ROUTE OF ADMINISTRATION	
INTRAVENOUS (IV)	INTRAMUSCULAR (IM) *Should only be used in the short term until IV access established*
flucloxacillin 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly	flucloxacillin 50 mg/kg (maximum single dose, 250 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly
If MRSA is known or suspected ADD vancomycin 15 mg/kg (maximum single dose, 90 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly	*If MRSA is known or suspected* ADD teicoplanin 16 mg/kg 24 hourly on day 1, then 8 mg/kg 24-hourly (maximum single dose, 128mg)

INDICATION: TERM NEONATE – MENINGITIS *seek expert advice for preterm neonate*

ROUTE OF ADMINISTRATION	
INTRAVENOUS (IV)	INTRAMUSCULAR (IM) *Should only be used in the short term until IV access established*
ampicillin 100 mg/kg (maximum single dose, 500 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly	ampicillin 100 mg/kg (maximum single dose, 500 mg) 0-7 days old, 12-hourly 8-28 days old, 8-hourly
PLUS	PLUS
cefotaxime 50 mg/kg (maximum single dose, 250) 0-7 days old, 8-hourly 8-28 days old, 6-8 hourly	cefotaxime 50 mg/kg (maximum single dose, 250) 0-7 days old, 8-hourly 8-28 days old, 6-8 hourly
Consider aciclovir 20 mg/kg, 8-hourly, if fever with no focus, severe sepsis, pneumonia, meningitis, seizures or if skin vesicles or ulceration is present.	

NEONATE MEDICATION ADMINISTRATION *Adapted with permission from Neonatal Medicines Formulary Consensus Group*

- From a microbiological perspective, injectable medication **must be prepared immediately prior to administration** using aseptic technique
- Reconstitute antibiotics with sterile water for injection (WFI) unless stated otherwise in the table below
- Displacement volume is the volume that the powder component of a drug takes up upon reconstitution. It needs to be added to the diluent volume to ensure accuracy when calculating doses that are less than a full vial. Thus the diluent volume recommended in the Product Information (PI) may sometimes differ from the volume recommended in this guideline. The displacement volume provided is an estimate and this may vary between brands. Please check in the Product Information or with the manufacture

volume of diluent to reconstitute a vial + displacement volume of drug powder = final volume of vial

- If further dilution is required for IV injection or infusion, use sterile sodium chloride 0.9% or sterile glucose 5% unless stated otherwise
- Where possible use separate dedicated lines for resuscitation fluid and for medications. When injecting antibiotics directly into an IV injection port which has resuscitation fluid running:
  - clamp the infusion fluid line and flush with 0.5 - 1 mL sterile sodium chloride 0.9% solution
  - administer antibiotic over the required time
  - flush the line with 0.5 - 1 mL sterile sodium chloride 0.9% solution and recommence resuscitation fluid

Medication NEONATE	Availability	Reconstitution fluid/volume	Administration	Notes
aciclovir	Vial 250 mg/10 mL	250 mg/10 mL vial: add 40 mL water for injection to make 5mg/mL solution	**IV infusion:** over 60 minutes	**DO NOT GIVE INTRAMUSCULARLY** Dose interval adjusted if renal impairment
ampicillin	Vial 500 mg, 1 g	500 mg vial: add 4.7 mL of water for injection to make 100 mg/mL solution 1 g vial: add 9.3 mL of water for injection to make 100 mg/mL solution	**IV infusion:** over 5-10 minutes into the proximal cannula site with a maximum rate of 100 mg/minute	Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporin antibiotics Separate from aminoglycosides by clearing the lines with a flush as ampicillin inactivates them Higher doses should be diluted to 30 mg/mL and infused over 30 minutes

Medication NEONATE	Availability	Reconstitution fluid/volume	Administration	Notes
		IM solution: add 1.7 mL of water for injection to the 500 mg vial for reconstitution to make 250 mg/mL solution		In renal impairment the excretion of ampicillin will be delayed. In infants with severe renal impairment it may be necessary to reduce the total daily dose
benzylpenicillin	Vial 600 mg	600 mg vial: add 3.6 mL of water for injection to make 150 mg/mL solution	**IV infusion:** over 15-30 minutes. For larger doses infuse over 30-60 minutes (e.g. for meningitis)	Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporin antibiotics Separate from aminoglycoside administration by clearing the line with a flush as penicillins inactivate aminoglycosides
		IM solution: add 1.6 mL water for injection to the 600 mg vial to make 300 mg/mL solution	**IM injection:** Inject deep into a large muscle	
cefotaxime	Vial 500 mg, 1 g	500 mg vial: add 4.8 mL of water for injection to make 100 mg/mL solution	**IV injection:** Over 3-5 minutes. **IV infusion:** Infuse over 15-30 minutes via syringe driver.	Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporin antibiotics
		1 g vial: add 9.6 mL of water to make 100 mg/mL solution		
		IM solution: add 2 mL of water for injection to the 500 mg powder for reconstitution to make 230 mg/mL solution Vial can be reconstituted with lignocaine 0.5% to reduce pain of injection	**IM injection:** Inject deep into the gluteal muscle	
clindamycin	Ampoule 300 mg in 2 mL 600 mg in 4 mL	Reconstitution not required = 150 mg/mL	**Intermittent IV infusion:** Dilute to a maximum concentration of 18 mg/mL in sodium chloride 0.9% and infuse over 10 to 60 minutes Maximum rate is 30 mg/minute	Hypotension and cardiopulmonary arrest may occur if given by rapid IV bolus Can cause local irritation, pain and thrombophlebitis on administration
			IM injection: Deep IM injection; rotate sites, do not exceed 600 mg in a single injection	IM injection may cause pain, induration and sterile abscess

Medication NEONATE	Availability	Reconstitution fluid/volume	Administration	Notes
flucloxacillin	Vial 500 mg, 1 g	500 mg: add 4.6 mL of water for injection to make 100 mg/mL solution 1 g: add 9.3 mL of water for injection to make 100 mg/mL solution Draw up 2.5 mL (250 mg) of the solution and add 2.5 mL sodium chloride 0.9% to make a final volume of 5 mL with a concentration of 50 mg/mL	**IV injection:** Slow injection over 3–5 minutes	
		IM solution: 500 mg: add 1.6 mL water for injection or lignocaine 0.5% or 1% to make a final concentration 250 mg/1mL 1 g: add 3.3 mL water for injection or lignocaine 0.5% or 1% to 1 g to make a final concentration 250mg/1mL	**IM injection:** Inject deep into the gluteal muscle	Flucloxacillin causes significant pain and irritation with IM use
gentamicin	10 mg/1 mL ampoule – **paediatric strength**	**10 mg/1 mL - paediatric strength:** Add 1 mL (10 mg) of gentamicin to 4 mL sodium chloride 0.9% to make a final volume of 5 mL with a concentration of 2 mg/mL	**IV injection:** Slow infusion over 5 minutes	Gentamicin is inactivated by penicillins and cephalosporins so should not be mixed in the same solution or administered simultaneously Ensure the line is adequately flushed if administered consecutively

Medication NEONATE	Availability	Reconstitution fluid/volume	Administration	Notes
	80 mg/2 mL ampoule – **adult strength**	**80 mg/2 mL - adult strength:** Add 1 mL (40 mg) of gentamicin to 19 mL sodium chloride 0.9% to make a final volume of 20 mL with a concentration of 2 mg/mL		
		IM solution: Reconstitution not required	**IM injection:** administer undiluted	
metronidazole	Infusion bag 500 mg/100mL	Reconstitution not required	**IV infusion:** 20 -30 minutes. Maximum rate is 25 mg/minute	**DO NOT GIVE INTRAMUSCULARLY**
teicoplanin	Vial: 400 mg + water for injection diluent	Add entire ampoule of water for injection diluent supplied = 400 mg/3 mL =133 mg/mL Do not shake when mixing, roll gently avoiding foam formation	**IV injection:** Give undiluted or diluted and inject slowly over 5 minutes **Intermittent IV infusion:** Dilute to a convenient volume and infuse over 30 minutes **IM injection:** Inject no more than 400 mg/3 mL at a single site	Caution: cross sensitivity may occur in patients with a history of hypersensitivity to vancomycin but is not a contraindication

Medication NEONATE	Availability	Reconstitution fluid/volume	Administration	Notes
vancomycin	Vial 500 mg, 1 g	500 mg: add 10 mL of water for injection to make a 50 mg/mL solution Draw up 1 mL (50 mg) of vancomycin and add 9 mL glucose 5% or sodium chloride 0.9% to make a final volume of 10 mL with a final concentration of 5 mg/mL To prepare 10 mg/mL concentration: Add 10 mL of water for injection to the 500 mg vial to make a 50 mg/mL solution Draw up 2 mL (100 mg) of vancomycin and add 8 mL glucose 5% or sodium chloride 0.9% to make a final volume of 10 mL with a final concentration of 10 mg/mL	IV infusion: 60 minutes	DO NOT GIVE INTRAMUSCULARLY Monitor renal function, full blood count, hearing function and serum vancomycin concentrations Trough level: 10-20 mg/L Aim for higher trough level of 15-20 mg/L in suspected severe sepsis e.g., MRSA, bone infection, meningitis, endocarditis Trough concentration should be taken within an hour prior to the 2nd dose for 18 hourly dosing, 4th dose for all other frequencies Check concentration prior to the 4th dose after any change in dose or frequency Perform weekly monitoring for prolonged courses More frequent monitoring may be required in renal impairment or for those receiving other nephrotoxic drugs or in suspected severe sepsis

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