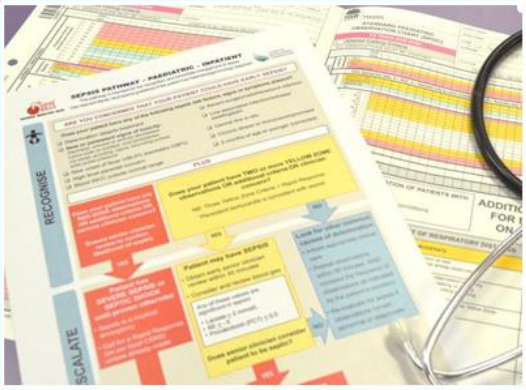
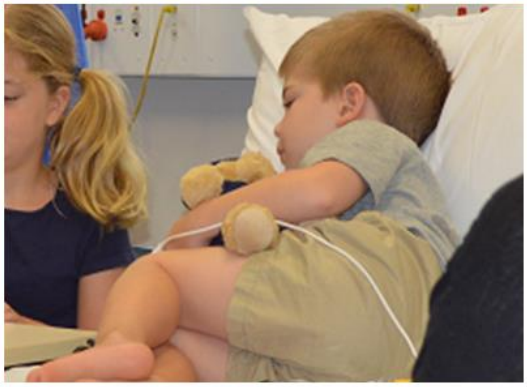
PAEDIATRIC
ANTIBIOTIC GUIDELINE
FOR SEVERE SEPSIS AND SEPTIC SHOCK

Updated September 2016

Version 3





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DOCUMENT PURPOSE

The Clinical Excellence Commission's (CEC) Paediatric Antibiotic Guideline for Severe Sepsis & Septic Shock aims to guide the prescription and timely administration of antibiotics for **paediatric patients (one month – 16 years) that have a diagnosis of severe sepsis or septic shock**, where the source is suspected or unknown.

Definitions of 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

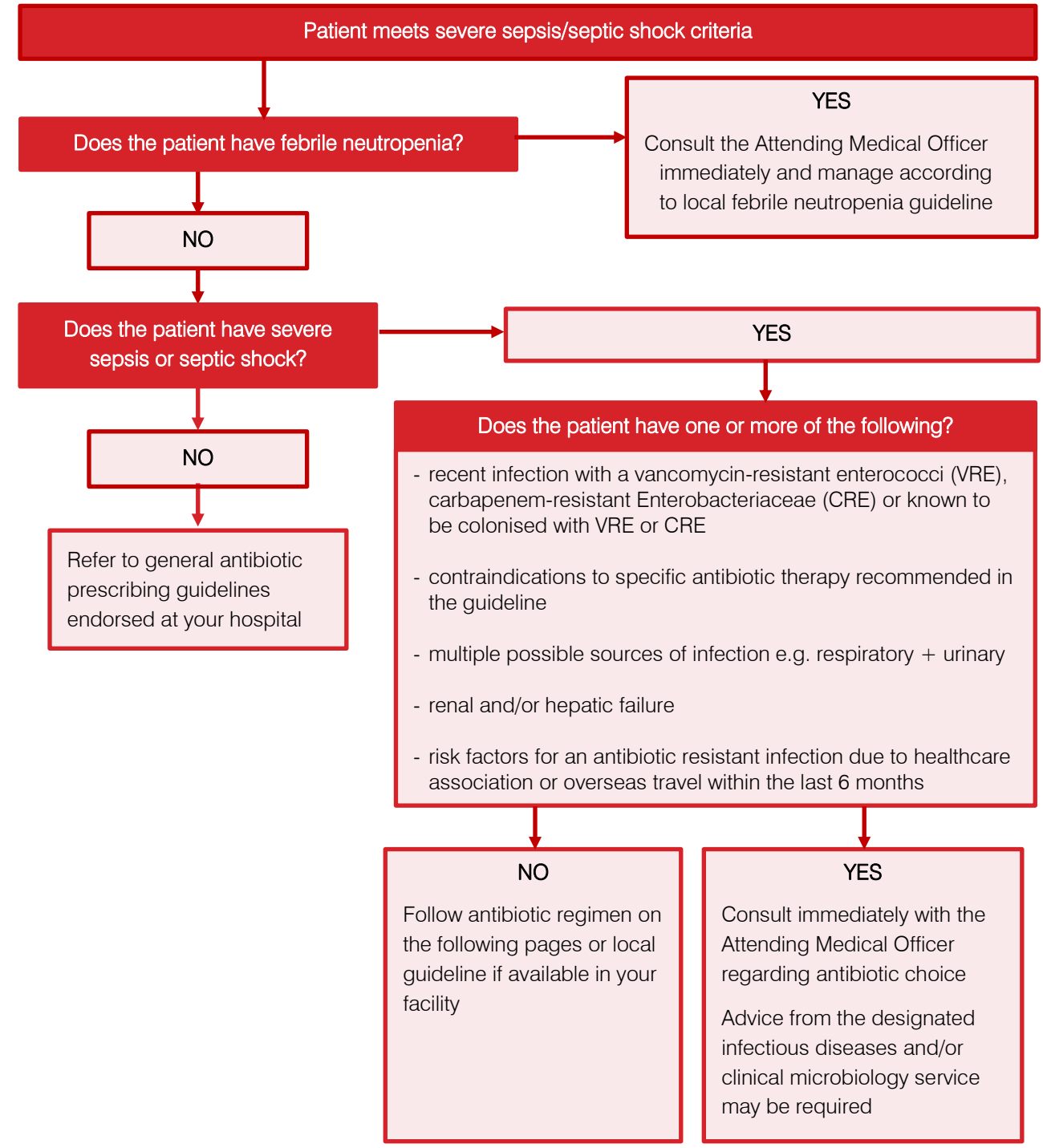
This guideline is not intended for:

- Neonatal patients (less than one month of age) → consult with paediatrician or neonatologist
- Patients with febrile neutropenia → use local febrile neutropenia guideline
- 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
- Patients who do not have severe sepsis or septic shock as defined above, but have sepsis or infection, either suspected or confirmed → use antibiotic prescribing guidelines endorsed at your hospital 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
- Patients who have been discharged from hospital in the last 7 days → seek expert advice to determine therapy.

IMPORTANT POINTS TO CONSIDER WHEN USING THIS GUIDELINE:

- The selection of appropriate antibiotic therapy is complex - this guideline is 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 clinical specimens (e.g. urine, cerebrospinal fluid, wound swabs) as appropriate 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 seek expert advice
- Patients must be weighed to ensure correct dosage of medications
- Clinicians must document the indication, drug name, dose, route of administration and review date for antibiotics in the patient's health record
- Antibiotic therapy should be reviewed by the treating team 24 hours and 48 hours after commencement
- Antibiotics should be reviewed once microbiology results are available, and continued, changed or ceased as required.

PAEDIATRIC ANTIBIOTIC GUIDELINE FOR SEVERE SEPSIS & SEPTIC SHOCK DECISION TREE



Further management:

The patient should be reviewed by the Attending Medical Officer within 24 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: 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 **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	ceftriaxone 50 mg/kg up to 2 g, daily **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	ciprofloxacin 10 mg/kg up to 400 mg, 8-hourly **PLUS** vancomycin 15mg/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 15mg/kg actual body weight up to 750 mg, 6-hourly	cefotaxime 50 mg/kg up to 2 g, 8-hourly **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	moxifloxacin 10 mg/kg up to 400 mg, daily
Intramuscular (IM) (should only be used in the short term until IV access established)	ceftriaxone 50 mg/kg up to 2 g, 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	ceftriaxone 50 mg/kg up to 2 g, 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	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** 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: 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: SEVERE SEPSIS SECONDARY TO HOSPITAL-ACQUIRED PNEUMONIA, LOWER RISK OF MULTI-RESISTANT ORGANISMS [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 15mg/kg actual body weight up to 750 mg, 6-hourly	ceftriaxone 50 mg/kg up to 2 g, daily **PLUS** vancomycin 15mg/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 to16 years of age:** maximum dose 560 mg, daily **PLUS** vancomycin 15mg/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 15mg/kg actual body weight up to 750 mg, 6-hourly	cefotaxime 50 mg/kg up to 2 g, 8-hourly **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	ciprofloxacin 10 mg/kg up to 400 mg, 8-hourly **PLUS** vancomycin 15mg/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 to16 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 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: SEVERE SEPSIS SECONDARY TO HOSPITAL-ACQUIRED PNEUMONIA , HIGHER RISK OF MULTI-RESISTANT ORGANISMS [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+0.5g, 6-hourly **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly **OR** cefepime 50 mg/kg up to 2 g, 8-hourly **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	cefepime 50 mg/kg up to 2 g, 8-hourly **PLUS** vancomycin 15mg/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 to16 years of age:** maximum dose 560 mg, daily **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly **OR** ciprofloxacin 10 mg/kg up to 400 mg, 8-hourly **PLUS** vancomycin 15mg/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 to16 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: 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 to16 years of age:** maximum dose 560 mg, daily **PLUS** amoxycillin/ampicillin 50 mg/kg up to 2 g, 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 to16 years of age:** maximum dose 560 mg, daily **PLUS** vancomycin 15mg/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 to16 years of age:** maximum dose 560 mg, daily **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly
	If ESBL-producing organisms are known or suspected [Note 2] **USE** amikacin 30 mg/kg up to 1.25 g, daily **OR** meropenem 40mg/kg up to 2g, 8-hourly	*If ESBL-producing organisms are known or suspected* [Note 2] **USE** amikacin 30 mg/kg up to 1.25 g, daily **OR** meropenem 40mg/kg up to 2g, 8-hourly	*If ESBL-producing organisms are known or suspected* [Note 2] **USE** amikacin 30 mg/kg up to 1.25 g, daily
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 **PLUS** amoxycillin/ampicillin 50 mg/kg up to 2 g, 6-hourly **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 to16 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	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** 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: In severe sepsis, gentamicin 7.5 mg/kg ideal body weight (IBW) is recommended.

Note 2: Risk factors for 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: 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 **PLUS** amoxycillin/ampicillin 50 mg/kg up to 2 g, 6-hourly **PLUS** metronidazole 12.5 mg/kg up to 500 mg,12-hourly	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** vancomycin 15mg/kg (actual body weight) up to 750 mg, 6-hourly **PLUS** metronidazole 12.5 mg/kg up to 500 mg,12-hourly	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** vancomycin 15mg/kg (actual body weight) up to 750 mg, 6-hourly **PLUS** 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 **PLUS** amoxycillin/ampicillin 50 mg/kg up to 2 g, 6-hourly **PLUS** clindamycin 15 mg/kg up to 600 mg, 8-hourly **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 to16 years of age:** maximum dose 560 mg, daily **PLUS** clindamycin 15 mg/kg up to 600 mg, 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 to16 years of age:** maximum dose 560 mg, daily **PLUS** clindamycin 15 mg/kg up to 600 mg, 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

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

INDICATION: 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 **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	cephazolin 50 mg/kg up to 2 g, 8-hourly **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly
	For water related infections ***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 **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	cephazolin 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	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

INDICATION: 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 **PLUS** flucloxacillin 50 mg/kg up to 2 g, 4-hourly **PLUS** vancomycin 15mg/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 to16 years of age:** maximum dose 560 mg, daily **PLUS** cephazolin 50 mg/kg up to 2 g, 8-hourly **PLUS** vancomycin 15mg/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 to16 years of age:** maximum dose 560 mg, daily **PLUS** vancomycin 15mg/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 **PLUS** flucloxacillin 50 mg/kg up to 2 g, 4-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 to16 years of age:** maximum dose 560 mg, daily **PLUS** cephazolin 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 to16 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: 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: 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 **PLUS** ceftriaxone 50 mg/kg up to 2 g,12 hourly **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days **PLUS** ceftriaxone 50 mg/kg up to 2 g,12 hourly **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days **PLUS** vancomycin 15mg/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 **PLUS** cefotaxime 50 mg/kg up to 2 g, 6-hourly **PLUS** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days **PLUS** cefotaxime 50 mg/kg up to 2 g, 6-hourly **PLUS** vancomycin 15mg/kg (actual body weight) up to 750 mg, 6-hourly	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic then 6-hourly for 4 days **PLUS** moxifloxacin 10 mg/kg up to 400 mg, daily
	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		
	If there is a risk of listeria [Note 2] ADD	*If there is a risk of listeria* [Note 2]	*If there is a risk of listeria* [Note 2]
	amoxycillin/ampicillin 50 mg/kg up to 2 g, 6-hourly	seek expert advice	seek expert advice

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

Note 2: Patients at risk of listeria include:

- pregnant women, their unborn and newborn children;
- people of all ages whose immune systems have been weakened by disease or illness, e.g. cancer, leukemia, AIDS, diabetes, liver or kidney disease and anyone on medication that can suppress the immune system, e.g. prednisone or cortisone, including organ transplant patients.

INDICATION: 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 **PLUS** ceftriaxone 50 mg/kg up to 2 g,12-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	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic **PLUS** ceftriaxone 50 mg/kg up to 2 g,12-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	dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic **PLUS** ***ORAL*** moxifloxacin 10 mg/kg up to 400mg, daily **[Note 2]** **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 **OR** dexamethasone **[Note 1]** 0.15 mg/kg up to 10 mg, with first antibiotic **PLUS** ***ORAL*** ciprofloxacin 20 mg/kg up to 750 mg, 12-hourly **[Note 2]** **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
	If there is a risk of listeria [Note 3] **ADD**	***If there is a risk of listeria*** [Note 3]	***If there is a risk of listeria*** [Note 3]
	amoxycillin/ampicillin 50 mg/kg up to 2 g, 6-hourly	seek expert advice	seek expert advice

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

Note 2: Moxifloxacin and ciprofloxacin CANNOT be given IM

Note 3: Patients at risk of listeria include:

- pregnant women, their unborn and newborn children;
- people of all ages whose immune systems have been weakened by disease or illness, for example cancer, leukemia, AIDS, diabetes, liver or kidney disease and anyone on medication that can suppress the immune system, e.g. prednisone or cortisone, including organ transplant patients.

INDICATION: 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 **PLUS** 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** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	cefotaxime 50 mg/kg up to 2 g, 6-hourly **PLUS** 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** vancomycin 15mg/kg actual body weight up to 750 mg, 6-hourly	ciprofloxacin 10 mg/kg up to 400 mg, 8-hourly **PLUS** vancomycin 15mg/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 **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 **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	ceftriaxone 50 mg/kg up to 4 g, daily **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 **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 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** 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: In severe sepsis, gentamicin 7.5 mg/kg ideal body weight (IBW) is recommended.

NOTES FOR 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 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. **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.

MEDICATION ADMINISTRATION TABLE *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	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	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/paralysis Potential for ototoxicity and nephrotoxicity - adjust in renal failure
			IM injection: Inject undiluted into a large muscle mass	
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 250 mg/mL or weaker deep into a large muscle.	
		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 **Do NOT administer lignocaine solution intravenously**
		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	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	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 large muscle mass	

Medication	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 injections 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, 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	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 orintramuscularly** Avoid extravasation Contraindicated in patients with severe hypersensitivity to penicillins, carbapenems and cephalosporins

Medication	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

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