GUIDELINE	
Sepsis and Bacteraemia: Paediatric (Neonates and immunocompetent children)	
Scope (Staff):	Medical, Nursing, Pharmacy
Scope (Area):	Perth Children's Hospital (PCH)

This document should be read in conjunction with this DISCLAIMER

- In patients with suspected sepsis, microbiological cultures must be collected and antimicrobial therapy should be administered IMMEDIATELY (ideally within 15 minutes). If collection of specimens for culture (e.g. lumbar puncture) is delayed, DO NOT DELAY ANTIBIOTIC ADMINISTRATION.
- These guidelines should be read in conjunction with the Emergency Department Guidelines: Management summary of severe sepsis/septic shock
- Empiric antibiotics are listed below in the order they should be administered. The administration of ceftriaxone, cefotaxime, cefepime or gentamicin should be prioritised above vancomycin which has a longer infusion time.
- Management of sepsis should take into consideration previous microbiological results and recent travel history.
- Consider discussing all children who present with severe sepsis with the Infectious Diseases Department or Clinical Microbiology Services.
- Empirical regimens are intended for initial therapy (up to 48 hours only) therapy should be modified as soon as additional information (source of infection, Gram stain results, culture and susceptibility testing) is available.

Refer to the separate ChAMP guidelines for children with Presumed Meningitis and Meningoencephalitis or Fever and Suspected or Confirmed Neutropenia: Empiric Guidelines

<table>
<tr><th colspan="2" rowspan="2">CLINICAL SCENARIO</th><th colspan="4">DRUGS/DOSES</th></tr>
<tr><th>Standard Protocol</th><th>Known or Suspected MRSA[a]</th><th>Low risk Penicillin allergy[b]</th><th>High risk Penicillin allergy[b]</th></tr>
<tr><td colspan="6">Neonatal viral infections can sometimes present with neonatal sepsis. Consider herpes simplex virus (HSV) testing and ADD IV aciclovir for suspected HSV infection; dose as per KEMH neonatal guidelines. For further information refer to ASID perinatal guidelines
HSV infection may manifest as:
• Localised skin, eye and mucous membranes disease (~45%)
• Central nervous system (CNS) disease (~30%)
• Disseminated disease - liver, lungs +/- CNS) (~25%)
Maternal history of HSV may be absent in >75% cases of neonatal HSV and up to 40% of neonatal HSV cases will not have skin lesions. Disseminated disease presents with viral sepsis, and may be indistinguishable from sepsis of another cause, i.e. respiratory collapse, pneumonitis, liver failure, disseminated intravascular coagulation (DIC). CNS disease presents with lethargy, poor feeding, bulging fontanel and seizures.</td></tr>
<tr><td rowspan="4">Neonatal sepsis (<1month old Corrected Gestational Age)</td><td rowspan="2">Early onset neonatal sepsis
(within 72 hours of birth)
Meningitis excluded</td><td>IV gentamicin
AND
IV benzylpenicillin
doses as per neonatal guidelines</td><td>As per standard protocol</td><td colspan="2">Discuss with ID or Microbiology service</td></tr>
<tr><td colspan="4">Neonatal viral infections[c] can sometimes present with neonatal sepsis. Consider HSV testing and ADD IV aciclovir for suspected HSV infection; dose as per KEMH neonatal guidelines. For further information refer to ASID perinatal guidelines</td></tr>
<tr><td rowspan="2">Early onset neonatal sepsis
(within 72 hours of birth)
Meningitis NOT excluded</td><td>IV cefotaxime
AND
IV benzylpenicillin
doses as per neonatal guidelines</td><td>As per standard protocol</td><td colspan="2">Discuss with ID or Microbiology service</td></tr>
<tr><td colspan="4">Neonatal viral infections[c] can sometimes present with neonatal sepsis. Consider HSV testing and ADD IV aciclovir for suspected HSV infection; dose as per KEMH neonatal guidelines. For further information refer to ASID perinatal guidelines</td></tr>
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CLINICAL SCENARIO		DRUGS/DOSES			
		Standard Protocol	**Known or Suspected MRSA[a]**	**Low risk Penicillin allergy[b]**	**High risk Penicillin allergy[b]**
Neonatal sepsis (<1month old Corrected Gestational Age)	Late onset (hospital acquired) neonatal sepsis (≥72 hours old)	IV gentamicin **AND** IV vancomycin doses as per neonatal guidelines			
		Neonatal viral infections[c] can sometimes present with neonatal sepsis. Consider HSV testing and **ADD** IV aciclovir for suspected HSV infection; dose as per KEMH neonatal guidelines. For further information refer to ASID perinatal guidelines			
	Community acquired neonatal sepsis Meningitis excluded	IV gentamicin **AND** IV amoxicillin doses as per neonatal guidelines	**ADD** vancomycin to standard protocol	Discuss with ID or Microbiology service	
		Neonatal viral infections[c] can sometimes present with neonatal sepsis. Consider HSV testing and **ADD** IV aciclovir for suspected HSV infection; dose as per KEMH neonatal guidelines. For further information refer to ASID perinatal guidelines			
	Community acquired neonatal sepsis Meningitis NOT excluded	IV cefotaxime **AND** IV amoxicillin **CONSIDER ADDING** IV gentamicin **IF** haemodynamically unstable doses as per neonatal guidelines	**ADD** vancomycin to standard protocol	Discuss with ID or Microbiology service	
		Neonatal viral infections[c] can sometimes present with neonatal sepsis. Consider HSV testing and **ADD** IV aciclovir for suspected HSV infection; dose as per KEMH neonatal guidelines. For further information refer to ASID perinatal guidelines			

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<tr><td rowspan="2">Sepsis</td><td rowspan="2">Community acquired sepsis with hemodynamic instability, unknown source
(≥1 month)
Contact Infectious Diseases Physician if patient is admitted to ICU.</td><td>GIVE IMMEDIATELY (within 15 minutes) of presentation
IV ceftriaxone 50mg/kg/dose (to a maximum of 2 grams) 12 hourly as a slow IV push over 5 minutes
AND
IV gentamicin[d] (refer to monograph for dose)
Gentamicin may be given as a push over 3 to 5 minutes in critically unwell patients
CONSIDER ADDING
IV vancomycin[e] 15mg/kg/dose (to a maximum initial dose of 750mg) 6 hourly
IF:
• Gram-positive cocci are seen on Gram stain; OR
• has been recently treated with a penicillin, cephalosporin or carbapenem antibiotic OR
• patient is too unwell to undergo a lumbar puncture</td><td colspan="2">As per standard protocol</td><td>Discuss with ID or Microbiology service</td></tr>
<tr><td colspan="4">If HSV encephalitis suspected ADD IV aciclovir</td></tr>
<tr><td rowspan="2">Fever without focus</td><td rowspan="2">Fever >38˚C without a source and with no hemodynamic instability
(1 to ≤3 months)
OR
Child ≥ 3 months old with suspicion of bacteraemia as determined by a senior clinician</td><td>IV ceftriaxone 50mg/kg/dose (to a maximum of 2 grams) 24 hourly</td><td colspan="2">As per standard protocol</td><td>Discuss with ID or Microbiology service</td></tr>
<tr><td colspan="4">Febrile children >3 months who are well without signs of serious illness (as judged by a senior Clinician) are not routinely recommended antibiotics. Observation and investigation is recommended.
If meningitis is suspected, refer to ChAMP empiric guidelines: Meningitis and meningoencephalitis</td></tr>
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CLINICAL SCENARIO		DRUGS/DOSES			
		Standard Protocol	**Known or Suspected MRSA[a]**	**Low risk Penicillin allergy[b]**	**High risk Penicillin allergy[b]**
Sepsis	Healthcare-Associated Sepsis i.e. presumed serious bacterial infection with no known source (≥ 1 month): includes community acquired sepsis with central venous access device (CVAD) in place	Management of Healthcare-Associated Sepsis should take into consideration previous microbiological results. For therapeutic advice, discuss with Infectious Diseases or Clinical Microbiology services			
		GIVE IMMEDIATELY (within 15 minutes) of presentation IV cefepime 50mg/kg/dose (to a maximum of 2 grams) 8 hourly **AND** IV vancomycin[e] 15mg/kg/dose (to a maximum initial dose of 750mg) 6 hourly **CONSIDER ADDING (as a stat dose)** IV gentamicin[d] (refer to monograph for dose) Gentamicin may be given as a push over 3 to 5 minutes in critically unwell patients	As per standard protocol		Discuss with ID or Microbiology service
Asplenia	Fever in an asplenic patient	IV ceftriaxone 50mg/kg/dose (to a maximum of 2 grams) 24 hourly **CONSIDER ADDING** IV vancomycin[e] 15mg/kg/dose (to a maximum initial dose of 750mg) 6 hourly **IF** haemodynamically unstable	Discuss with ID or Microbiology services	As per standard protocol	Discuss with ID or Microbiology services

CLINICAL SCENARIO		DRUGS/DOSES			
		Standard Protocol	**Known or Suspected MRSA[a]**	**Low risk Penicillin allergy[b]**	**High risk Penicillin allergy[b]**
Endovascular > 1 month old	Endocarditis or other endovascular infection; native valve or homograft	For patients with presumed endocarditis THREE sets of blood cultures should be taken from separate venepuncture sites prior to antibiotic administration.			
		IV benzylpenicillin 50mg/kg/dose (to a maximum of 2.4 grams) 4 hourly **AND** IV flucloxacillin 50mg/kg/dose (to a maximum of 2 grams) 4 hourly **AND** IV gentamicin[d] (refer to monograph for dose)	gentamicin[d] **AND** flucloxacillin[f] **AND** vancomycin[e]	gentamicin[d] **AND** cefazolin[g] **AND** vancomycin[e]	gentamicin[d] **AND** vancomycin[e]
	Endocarditis or other endovascular infection; prosthetic valve or graft	For patients with presumed endocarditis THREE sets of blood cultures should be taken from separate venepuncture sites prior to antibiotic administration.			
		IV flucloxacillin 50 mg/kg/dose (to a maximum of 2 grams) 4 hourly **AND** IV vancomycin[e] 15mg/kg/dose (maximum initial dose 750mg) 6 hourly **AND** IV gentamicin[d] (refer to monograph for dose)	As per standard protocol	gentamicin[d] **AND** cefazolin[g] **AND** vancomycin[e]	gentamicin[d] **AND** vancomycin[e]

a. Children known or suspected to be colonised with MRSA may need to have their therapy/prophylaxis modified. Children suspected of having MRSA include:
    i. Children previously colonised with MRSA
    ii. Household contacts of MRSA colonised individuals
    iii. In children who reside in regions with higher MRSA rates (e.g. Kimberley and the Pilbara) a lower threshold for suspected MRSA should be given
    iv. Children with recurrent skin infections or those unresponsive to ≥ 48 of beta-lactam therapy. For further advice, discuss with Microbiology or ID service
b. Refer to the ChAMP Beta-lactam Allergy Guideline
    - Low risk allergy: a delayed rash (>1hr after initial exposure) without mucosal or systemic involvement (without respiratory distress and/or cardiovascular compromise).
    - High risk allergy: an immediate rash (<1hr after exposure); anaphylaxis; severe cutaneous adverse reaction {e.g. Drug Rash with Eosinophilia and Systemic Symptoms (DRESS) and Stevens – Johnson syndrome (SJS) / Toxic Epidermal Necrolysis (TEN)} or other severe systemic reaction.
c. HSV infection may manifest as:
    - Localised skin, eye and mucous membranes disease (~45%)
    - CNS disease (~30%)
    - Disseminated disease - liver, lungs +/- CNS (~25%)

    Maternal history of HSV may be absent in >75% cases of neonatal HSV and up to 40% of neonatal HSV cases will not have skin lesions. Disseminated disease presents with viral sepsis, and may be indistinguishable from sepsis of another cause, i.e. respiratory collapse, pneumonitis, liver failure, DIC. CNS disease presents with lethargy, poor feeding, bulging fontanel and seizures.
d. IV gentamicin: may be given as a push over 3 to 5 minutes in critically unwell patients.
    - Children ≥1 month – 10 years: 7.5mg/kg/dose (to a maximum of 320mg) 24 hourly
    - >10years to 18 years: 6-7mg/kg/dose (to a maximum of 560mg) 24 hourly.
    - Therapeutic drug monitoring required if therapy extends beyond 72 hours.
e. IV vancomycin **15mg/kg/dose** (maximum initial dose 750mg) 6 hourly via slow infusion. Therapeutic drug monitoring required.
f. IV flucloxacillin **50mg/kg/dose** (to a maximum of 2 grams) 4 hourly.
g. IV cefazolin **50mg/kg/dose** (to a maximum of 2 grams) 8 hourly (6 hourly dosing may be considered in discussion with ID).

Related CAHS internal policies, procedures and guidelines
Antimicrobial Stewardship Policy (PCH Website)
ChAMP Empiric Guidelines

References and related external legislation, policies, and guidelines

1. Antibiotic Writing Group (2020). eTG complete. West Melbourne, Therapeutic Guidelines Ltd.
2. Deep A (2020). BMJ Best Practice - Sepsis in Children, BMJ Publishing Group Limited.
3. Weiss S and Pomerantz W (2020). Septic shock in children: Rapid recognition and initial resuscitation (first hour), UptoDate.

Expert opinion – Paediatric Infectious Diseases Physicians

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File Path:	W:\Safety & Quality\CAHS\CLOVERS MEDICAL Pharmacy\Procedures Protocols and Guidelines\ChAMP\Word\Empiric Guidelines\PCH Templated (ED Guidelines)		
Document Owner:	Head of Department – Infectious Diseases		
Reviewer / Team:	Children's Antimicrobial Management Program Pharmacist		
Date First Issued:	November 2013	Last Reviewed:	December 2020
Amendment Dates:	April 2019, April 2020, October 2020, December 2020	Next Review Date:	December 2023
Approved by:	Drug and Therapeutics Committee	Date:	December 2020
Endorsed by:	Chair, Drug and Therapeutics Committee	Date:	December 2020
Standards Applicable:	NSQHS Standards:  NSMHS: N/A Child Safe Standards: N/A		
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