GUIDELINE

Meningitis and Meningoencephalitis

Scope (Staff):	Clinical Staff – Medical, Nursing, Pharmacy
Scope (Area):	Perth Children's Hospital (PCH)

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this disclaimer

- In patients with suspected meningitis, microbiological cultures should be collected (unless contraindicated) and antimicrobial therapy should be given as soon as possible, ideally within 60 minutes of presentation to hospital.
- 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.
- 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 and susceptibility testing) is available.
- Refer to the separate ChAMP guidelines for children with Sepsis and Bacteraemia

<table>
<tr><th rowspan="2">CLINICAL SCENARIO</th><th rowspan="2">Usual duration</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 rowspan="2">Meningitis / meningoencephalitis
< 4 weeks of age
(community acquired)</td><td rowspan="2">See below</td><td>IV cefotaxime
AND
IV benzylpenicillin
AND
IV aciclovir (doses as per neonatal guidelines)</td><td colspan="3">Discuss with ID or Microbiology Service</td></tr>
<tr><td colspan="4">• Discuss all cases with ID/microbiology
• Send CSF for cell count, protein, glucose, culture and viral PCR (HSV, enterovirus, parechovirus)
• In addition consider blood culture, EDTA blood for HSV PCR, enterovirus/parechovirus swabs (throat, and rectal) and HSV swabs (throat, rectal, eye, umbilical)
• For further information refer to ASID perinatal guidelines</td></tr>
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<tr><td rowspan="3">Meningitis
≥ 4 weeks of age
(community acquired)</td><td colspan="5">Give IV dexamethasone before or up to four hours post the first dose of antibiotics as per local guidelines.
Consider the need to also cover for HSV encephalitis (see below).
Give antibiotics as soon as possible, ideally within 60 minutes of hospital presentation.</td></tr>
<tr><td>See below</td><td>IV ceftriaxone 50 mg/kg/dose (to a maximum of 2 grams) 12 hourly
ADD
IV vancomycin[c] 15 mg/kg/dose (to a maximum initial dose of 750mg) 6 hourly via slow infusion if:
i.) Gram-positive cocci are seen on Gram stain; OR
ii.) the patient has known or suspected otitis media or sinusitis; OR
iii.) Pneumococcal nucleic acid amplification test (NAAT) is positive on CSF
iv.) has been recently treated with a penicillin, cephalosporin or carbapenem antibiotic OR
v.) is too unwell to undergo a lumbar puncture</td><td>As per standard protocol</td><td>IV moxifloxacin[d]</td></tr>
<tr><td colspan="5">Once the organism has been identified and the results of susceptibility testing are available choose the appropriate directed regimen and duration:
N. meningitidis 5 days
S. pneumoniae 10-14 days
H. influenzae 7 days
Group B streptococcus 14-21 days
Gram negative bacilli 21 days
Listeria 21 days
No pathogen identified – Discuss with ID or Microbiology Service
For confirmed N. meningitidis, H. influenzae or S. pyogenes meningitis, consider the need for post exposure prophylaxis and/or vaccination for contacts as per the ChAMP Medical prophylaxis guideline.</td></tr>
</table>

CLINICAL SCENARIO	Usual duration	DRUGS/DOSES			
		Standard Protocol	Known or Suspected MRSA[a]	Low risk Penicillin allergy[b]	High risk Penicillin allergy[b]
Encephalitis ≥ 4 weeks of age	14-21 days if HSV confirmed	*If bacterial meningitis or sepsis has **not** been excluded, in addition to encephalitis treatment, start antibiotics as per Meningitis recommendations above.* IV aciclovir Term to <12 years: 20 mg/kg/dose (to a maximum of 750 mg) 8 hourly; ≥ 12 years old: 10 mg/kg/dose (to a maximum of 750 mg) 8 hourly **IF** influenza A or B detected on respiratory PCR **ADD** Oral oseltamivir 3 mg/kg/dose (to a maximum of 75 mg) twice daily for five days			
		Major criteria (required): • Decreased or altered level of consciousness or lethargy or personality change lasting >24 hours ***Minor criteria (2 for possible; >3 for probable/confirmed encephalitis):*** • Documented fever (>38°C) within 72 hours before or after presentation. • Generalised or partial seizures not fully attributable to a pre-existing seizure disorder. • New onset of focal neurological findings. • CSF WBC count >5/mm^3. • New abnormality of brain parenchyma on neuro-imaging suggestive of encephalitis. • Abnormality on EEG that is consistent with encephalitis.			
		Herpes simplex encephalitis can usually be excluded and empirical therapy stopped based on negative CSF PCR and a normal MRI. However, tests for herpes simplex virus in CSF can be negative in very early disease (before day 3 of illness); consider a repeat lumbar puncture and HSV PCR if clinical suspicion is high. If concerns for HSV encephalitis persist despite a negative PCR please discuss with ID or Clinical microbiology.			

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<tr><td rowspan="2">Suspected or proven nosocomial or post-neurosurgical meningitis (including shunt meningitis)</td><td rowspan="2">10-14 days</td><td>IV cefepime 50mg /kg/dose (to a maximum of 2 grams) 8 hourly

AND

IV vancomycin 15mg /kg/dose (to a maximum initial dose of 750 mg) 6 hourly via slow infusion.</td><td colspan="2">As per standard protocol</td><td>Discuss with ID or Microbiology Service</td></tr>
<tr><td colspan="4">If CSF cultures are consistently positive, extend treatment for 14 days after the last positive culture in discussion with Infectious Diseases</td></tr>
<tr><td>Meningitis/ meningoencephalitis in an immunocompromised child</td><td>varies</td><td colspan="4">Discuss with ID or Microbiology service</td></tr>
</table>

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, Pilbara and the Goldfields) a lower threshold for suspected MRSA should be given
iv) Children with recurrent skin infections or those unresponsive to ≥ 48hours of beta-lactam therapy. For further advice, discuss with Clinical 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) IV vancomycin **15 mg/kg/dose** (maximum initial dose 750 mg) 6 hourly via slow infusion. Therapeutic drug monitoring required.

d) IV moxifloxacin **10 mg/kg/dose** (to a maximum of 400 mg) given once daily. Moxifloxacin is a red/restricted agent and requires ChAMP approval prior to prescribing.

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

References and related external legislation, policies, and guidelines
Antibiotic Writing Group. Therapeutic Guidelines - Antibiotic. West Melbourne: Therapeutic Guidelines Ltd; 2022. Available from: https://tgldcdp-tg-org-au.pklibresources.health.wa.gov.au/etgAccess

McMullen BJ, et al. (2016). "Antibiotic duration and timing of the switch from intravenous to oral route for bacterial infections in children: systematic review and guidelines." Lancet Infect Dis **16**: e139-152.
Britton P, et al. Consensus guidelines for the investigation of encephalitis in adults and children in Australia and New Zealand. Internal Medicine Journal. 2015;45:563-76.
Palasanthiran P, Starr M, Jones C, Giles M, editors. Management of Perinatal Infections 3rd edition. 3rd edition ed. Sydney: Australasian Society of Infectious Diseases; 2022.

Useful resources (including related forms)
Healthfacts – Lumbar puncture (PCH Website)
ASID perinatal guidelines

This document can be made available in alternative formats on request.

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