### Central Nervous System 1

<table>
<thead>
<tr>
<th>Condition</th>
<th>Antibiotic first choice and Length of treatment</th>
<th>Alternative treatment/ PO switch option / True penicillin allergy/ Alternative regimens</th>
<th>Infection control / other Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empirical treatment</td>
<td>Antibiotics should be given immediately in severely ill patients i.e. before performing a lumbar puncture (if not contraindicated) but after blood cultures Ceftriaxone $\dagger$ 2g IV BD Or Cefotaxime 2g IV 4 - 6 hourly for 10 to 14 days and review.</td>
<td>Allergy to penicillin Not anaphylaxis: Meropenem 2g IV TDS +/- Vancomycin 500 -750MG IV QDS Anaphylaxis to penicillin: Chloramphenicol $\S$ $\dagger$100mg/kg IV daily in 4 divided doses contact Microbiology to discuss NOTE: maximum dose 4-6 g per day dose dependent BM toxicity. Levels may be required If resistant S. pneumo suspected (e.g recent travel abroad) Add in Vancomycin 500 -750MG IV QDS Vancomycin levels required (aim for 15-20 mg/L) if Listeria cover needed, and Allergy to penicillin Not anaphylaxis: Meropenem 2g IV TDS for 21 days and review. Gentamicin 2 mg/kg loading dose then 2 mg/kg IV TDS may be added but this should be discussed with Microbiologist Gentamicin pre and post levels ARE required if Listeria cover needed, and Anaphylaxis to penicillin: Trimethoprim-sulfametoxazole(Cotrimoxazole) 60-120mg/kg IV per day in divided doses 6–12 hourly (Based on trimethoprim component: 10-20 mg/kg; 10mg Trimethoprim is contained in 60mg Co-trimoxazole) Levels ARE required. Consider adding Rifampicin 600mg BD</td>
<td>Infection Control Isolation Precautions apply must be isolated for first 24 hours of antibiotics FFP2/3 Masks to be worn for first 24 hours of antibiotics Discuss with Microbiologist Contact Public Health Officer Contact tracing and prophylaxis against disease may be required Treatment to eliminate pharyngeal carriage (index case) may be required</td>
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<tr>
<td>Suspected bacterial Meningitis:</td>
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<tr>
<td>-Meningococcal meningitis Give Dexamethasone IV 10mg 6hourly for 2- 4 days ONLY if this can be started before within 6hours of first antibiotic dose, and should only be continued if CSF Gram stain reveals Gram-Positive diplococci, or if blood/CSF cultures are Positive for S. pnemoniae</td>
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<td>-Pneumococcal meningitis Contraindications for the use of steroids: • Viral meningitis • When diagnosis is in doubt • Patient already on antibiotics (including BenzylPenicillin from GP) • Patients with sepsis • Immunosuppressed patients • Meningitis following surgery If Listeria spp suspected: Add Amoxicillin 2g IV 4 hourly for 21 days and review. + Gentamicin 2 mg/kg IV loading dose then 1.7 mg/kg IV TDS may be added but this should be discussed with Microbiologist</td>
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<tr>
<td>-Haemophilus meningitis If altered mental status and or suspicion of acute viral encephalitis antivirals should be added (refer to viral encephalitis section) Immunocompromised/ Pregnant/ Alcoholism or other debilitating diseases/ impaired cellular immunity (cover for Listeria spp). &gt; 50 year-old to be considered to be discussed with Microbiologist If altered mental status and or suspicion of acute viral encephalitis antivirals should be added (refer to viral encephalitis section) Immunocompromised/ Pregnant/ Alcoholism or other debilitating diseases/ impaired cellular immunity (cover for Listeria spp). &gt; 50 year-old to be considered to be discussed with Microbiologist</td>
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<tr>
<td>Confirmed</td>
<td>Cefotaxime 2g IV 4-6 hourly for 7 days and review Or Ceftriaxone $\dagger$ 2g IV BD Or Benzylpenicillin 1.2g IV 4 hourly for 7 days and review Discontinue dexamethasone</td>
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<tr>
<td>Neisseria meningitidis meningitis</td>
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</tbody>
</table>

$\dagger$ High risk agent for Clostridium difficile associated diarrhoea (CDAD) 4398

$\S$ Dosing is based on actual body weight (ABW) unless patient is obese (20% over ideal body weight (IBW))

Obese dosing weight = IBW + 0.4 (ABW-IBW).

Males: IBW=50kg + 1kg for every cm over 150cm height; Females: IBW=45kg + 1kg for every cm over 150cm height
<table>
<thead>
<tr>
<th>Central Nervous System 2 / Contact Tracing and Prophylaxis</th>
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<tbody>
<tr>
<td><strong>Treatment to eliminate pharyngeal carriage (index case)</strong></td>
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<tr>
<td>Ceftriaxone eliminates carriage of meningococcus</td>
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<tr>
<td>Patients who have not received ceftriaxone should be given oral ciprofloxacin 500mg stat or Rifampicin 600mg bd for 2 days (if ciprofloxacin intolerant). Both are contra-indicated in pregnancy and advice should be sought from Microbiology</td>
</tr>
<tr>
<td>HIB Chemoprophylaxis with rifampicin may be required for children &lt;10 years or vulnerable person in household e.g. child&lt;10 years, immunosuppressed or asplenic person of any age</td>
</tr>
</tbody>
</table>

**Contact tracing and prophylaxis**

**Haemophilus influenzae type-B**

- Close contacts of patients with meningococcal disease should be given Rifampicin (<12 years) or ciprofloxacin prophylaxis (≥ 12 years). These include those living in same household, kissing/secretion contact with patient within previous 10 days, performed mouth to mouth resuscitation, had a definite droplet contamination from secretions. If patient attends school, college or university, inform CCDC.
- Rifampicin:
  - <12 months: 5mg/kg bd for 2 days
  - 1-12 years: 10mg/kg bd for 2 days (maximum 600 mg)
  - >12 years/adult: 600mg bd for 2 days

**Ceftriaxone eliminates carriage of meningococcus**

- Close contacts of patients with meningococcal disease should be given Rifampicin (<12 years) or ciprofloxacin prophylaxis (≥ 12 years). These include those living in same household, kissing/secretion contact with patient within previous 10 days, performed mouth to mouth resuscitation, had a definite droplet contamination from secretions. If patient attends school, college or university, inform CCDC.
- Rifampicin:
  - <12 months: 5mg/kg bd for 2 days
  - 1-12 years: 10mg/kg bd for 2 days (maximum 600 mg)
  - >12 years/adult: 600mg bd for 2 days

**Contra-indications to the use of Rifampicin:**

- Pregnancy
- Severe liver disease

**Alternatives for prophylaxis:**

- **Adults:** Ciprofloxacin 500mg po stat (Adults only) (NOT in pregnancy)
  - Ceftriaxone 250mg IM stat (125mg 1 month-12 years) (unlicensed indication, preferred if pregnant)

- **Children:**
  - Ciprofloxacin by mouth [unlicensed]
  - 2-5 years 125mg as a single dose
  - 5-12 years 250 mg as a single dose
  - 12-18 years 500 mg as a single dose

**Infection control / other Measures**

- Infection Control Isolation Precautions apply.
- Must be isolated for first 24 hours of antibiotics.
- FFP2/3 Masks to be worn for first 24 hours of antibiotics.
- Discuss with Microbiologist.
- Contact Public Health Officer ASAP.
- Contact tracing and prophylaxis against disease may be required.

**HIB Chemoprophylaxis with rifampicin may be required for children <10 years or vulnerable person in household e.g. child<10 years, immunosuppressed or asplenic person of any age**

- Close contacts of patients who have meningococcal disease should be given Rifampicin (<12 years) or ciprofloxacin prophylaxis (≥ 12 years). These include those living in same household, kissing/secretion contact with patient within previous 10 days, performed mouth to mouth resuscitation, had a definite droplet contamination from secretions. If patient attends school, college or university, inform CCDC.
- Rifampicin:
  - <12 months: 5mg/kg bd for 2 days
  - 1-12 years: 10mg/kg bd for 2 days (maximum 600 mg)
  - >12 years/adult: 600mg bd for 2 days

**Contra-indications to the use of Rifampicin:**

- Pregnancy
- Severe liver disease

**Alternatives for prophylaxis in such cases:**

- Ciprofloxacin 500mg po stat (Adults only) (NOT in pregnancy)
  - Ceftriaxone 250mg IM stat (125mg 1 month-12 years) (unlicensed indication)
Central Nervous System 3

### Brain abscess

**Empirical treatment for suspected bacterial infection**

Discuss with Neurosurgeons at Southampton

Contact microbiology to discuss investigations and treatment

**Treatment depends on origin. Empirical broad spectrum combination:**

- Cefotaxime 2g IV QDS
- Metronidazole 500 mg IV TDS
- Rifampicin 600 mg OD PO

**If S. aureus suspected:**

Add Vancomycin 500-750mg IV QDS until sensitivity known

Four weeks of IV antibiotics and review

Penicillin allergy **Not anaphylaxis:**

- Meropenem 6 g IV in 24 hours (8 hourly)
- + Rifampicin 600 mg PO BD

**Anaphylaxis to penicillin:**

- Chloramphenicol § 100mg/kg IV daily in 4 divided doses contact Microbiology to discuss
- + Vancomycin 500-750mg IV QDS
- Vancomycin levels required (aim for 15-20 mg/L)

Four weeks of IV antibiotics and review

Differential diagnosis list is large particularly in the immuno-compromised. Toxoplasma, Cryptococcus, tuberculosis, Nocardia, neoplasms. Epidemiology can be of help. SBE always to be included.

If Ct shows cerebritis or abscess <2.5 cm and patient neurologically stable and conscious, start antibiotics and observe. Otherwise, surgical drainage required.

**Infection control / other Measures**

If Ct shows cerebritis or abscess ≤2.5 cm and patient neurologically stable and conscious, start antibiotics and observe. Otherwise, surgical drainage required.

**Standard precautions apply, isolation is not required**

### TB Meningitis

**Note: need to exclude pulmonary TB and HIV infection**

Contact microbiology to discuss investigations and treatment

At least 6 mls of CSF should be taken exclusively for mycobacterial studies

Commercial nucleic acid amplification assays are recommended for all forms of CNS tuberculosis

The role of the Interferon-gamma release assays (IGRAs) is unclear on CSF and are not routinely recommended for the diagnosis of CNS tuberculosis

**Fully susceptible M. tuberculosis:**

- Isoniazid 300 mg PO 9 to 12 months
- + Rifampicin 450 mg (≤50 kg) or 600 mg max (≥50 kg) PO 9 to 12 months
- + Pyrazinamide 1.5g (≤50 kg) or 2g (≥50 kg) PO 2 months
- + Ethambutol 15 mg/kg PO 2 months

Full susceptibility M. tuberculosis:

- Isoniazid 300 mg PO 9 to 12 months
- + Rifampicin 450 mg (≤50 kg) or 600 mg max (≥50 kg) PO 9 to 12 months
- + Pyrazinamide 1.5g (≤50 kg) or 2g (≥50 kg) PO 2 months
- + Ethambutol 15 mg/kg PO 2 months

**Dexamethasone dose/route**

<table>
<thead>
<tr>
<th>Week</th>
<th>Grade I</th>
<th>Grade II and III</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.3 mg/kg/day IV</td>
<td>0.4 mg/kg/day IV</td>
</tr>
<tr>
<td>2</td>
<td>0.2 mg/kg/day IV</td>
<td>0.3 mg/kg/day IV</td>
</tr>
<tr>
<td>3</td>
<td>0.1 mg/kg/day oral</td>
<td>0.2 mg/kg/day IV</td>
</tr>
<tr>
<td>4</td>
<td>3 mg total/day oral</td>
<td>0.1 mg/kg/day IV</td>
</tr>
<tr>
<td>5</td>
<td>Reducing by 1 mg each week over 2 weeks</td>
<td>4 mg total/day oral</td>
</tr>
<tr>
<td>6</td>
<td>Reducing by 1 mg each week over 3 weeks</td>
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</tr>
</tbody>
</table>

**Infection control / other Measures**

Isolate in a side room if pulmonary TB is suspected until 3 –ve AAFB’s available.

FFP3 Masks to be worn till AAFB results available.

If Pulmonary TB excluded no need to isolate.

Contact the Infection Control team, Chest medicine consultant and TB nurse specialist need to be informed

Notify Public health

**High risk agent for Clostridium difficile associated diarrhoea (CDAD)**

§Dosing is based on actual body weight (ABW) unless patient is obese (20% over ideal body weight (IBW))

Obese dosing weight= IBW + 0.4 (ABW-IBW).

Males: IBW=50 kg + 1 kg for every cm over 150 cm height; Females: IBW=45 kg + 1 kg for every cm over 150 cm height
### Central Nervous System 4 / Viral Infections

<table>
<thead>
<tr>
<th>Condition</th>
<th>Antibiotic first choice and Length of treatment</th>
<th>Alternative treatment/ PO switch</th>
<th>Infection control / other Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Empirical treatment</strong>&lt;br&gt;Suspected Viral meningitis With NO neurological deficit&lt;br&gt;Treatment with antivirals is not recommended unless there is evidence of focal neurological deficit / encephalitis</td>
<td></td>
<td></td>
<td>Standard Precautions apply</td>
</tr>
<tr>
<td><strong>Empirical treatment</strong>&lt;br&gt;Suspected Viral Encephalitis:&lt;br&gt;Encephalitis is defined by the presence of an inflammatory process of the brain in association with clinical evidence of <a href="#">neurologic dysfunction</a>.&lt;br&gt;In Most cases it is not possible to exclude bacterial infection.&lt;br&gt;All patients should have antibiotic and antiviral cover started empirically initially. (refer to empirical treatment of suspected bacterial meningitis)</td>
<td>Aciclovir* 10mg/kg IV TDS for 14-21 days and review&lt;br&gt;Contact Microbiology diagnosis by PCR is required&lt;br&gt;PCR sensitivity increases if CSF taken after day 3. Negative PCR associated with low protein &amp; &lt;10 WBC per mm³ (CID 38:1335, 2003)&lt;br&gt;Treatment should be continued for a minimum of 14 days</td>
<td>Treatment should be continued for a minimum of 21 days&lt;br&gt;If clinical features of herpes simplex encephalitis or temporal lobe lesions on neuroimages consider repeating CSF PCR for herpes simplex 3-7 days later, a second negative result may allow discontinuation of acyclovir therapy</td>
<td>If open areas isolate in a side room&lt;br&gt;Isolate in a side room, exclude vulnerable people i.e. pregnant and Immunocompromised. Isolate till areas dry/crusted over.</td>
</tr>
<tr>
<td><strong>Confirmed</strong>&lt;br&gt;Herpes simplex virus</td>
<td>Aciclovir* 10mg/kg IV TDS for 21 days and review&lt;br&gt;There is a relapse rate up to 5% reported&lt;br&gt;Ganciclovir has shown efficacy in some patients with VZV meningo-encephalitis</td>
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<td></td>
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<tr>
<td><strong>Confirmed</strong>&lt;br&gt;Varicella zoster virus</td>
<td>Aciclovir* 10mg/kg IV TDS for 14 days</td>
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</table>

*Aciclovir might require dose adjustment if CrCl <25mL/minute