Management of Bacterial Meningitis in Children and Young People

Incorporates NICE Bacterial Meningitis and Meningococcal Septicaemia Guideline CG102. Distributed in partnership with NICE

2nd Edition

Meningitis Research Foundation

ENDORSED Royal College of Paediatrics and Child Health

Meningococcal Disease Algorithm www.meningitis.org

Symptoms and signs of bacterial meningitis?

YES

Check airway, breathing and circulation; gain vascular access

Signs of raised intracranial pressure (RICP) or shock?

YES

NO

Perform diagnostic tests BM1 **Correct any dehydration**

Contraindication to Lumbar Puncture? BM2

NO

Perform Lumbar Puncture
Do not await CSF results before starting antibiotics

YES

<3 months old?

YES

NO

Empiric antibiotics for suspected meningitis
IV Cefotaxime + either Amoxicillin or Ampicillin (can replace Cefotaxime with Ceftriaxone if no contraindication BM3)
DO NOT DELAY ANTIBIOTICS

Empiric antibiotics for suspected meningitis
IV Ceftriaxone unless contraindicated BM3
DO NOT DELAY ANTIBIOTICS

Add Vancomycin if recently overseas, or prolonged or multiple antibiotic exposure within last 3 months.

LP results available?

NO

YES

NO

Lumbar puncture suggests meningitis?
■ In neonates (<28 days old), ≥ 20 cells/µl ■ In older children > 5 cells/µl or > 1 neutrophil/µl
(if lower cell count, still consider bacterial meningitis if other symptoms and signs suggest the diagnosis especially in neonates).

NICE feverish illness guideline CG160 www.nice.org.uk/guidance/cg160

YES

■ **Consider TB meningitis** If raised CSF WBC count and risk factors for TB. If TB meningitis in differential diagnosis refer to NICE TB CG117 for appropriate antibiotic treatment
■ **Consider Herpes simplex meningoencephalitis**. If HSV in differential diagnosis give Aciclovir.

Steroids: Dexamethasone 0.15 mg/kg to a max dose of 10 mg, qds x 4 days for children ≥ 3 months old IF ≤ 12h from first antibiotics and LP shows:
■ frankly purulent CSF ■ CSF WBC count > 1000/µl ■ raised CSF WBC count and protein > 1 g/L ■ bacteria on Gram stain.
Steroids should not be used in developing countries.
If TB meningitis in the differential diagnosis, refer to NICE CG117 before administering steroids.

Reduced or fluctuating conscious level or focal neurological signs? BM4

YES

Perform CT Scan

NO

■ Full-volume maintenance fluids: enteral feeds if tolerated or isotonic IV fluids e.g. 0.9% Saline or 0.9% Saline with 5% Glucose
■ Do not restrict fluids unless there is evidence of increased anti-diuretic hormone secretion or RICP
■ Monitor fluid administration, urine output, electrolytes and blood glucose
■ See Meningococcal Disease Algorithm to treat seizures.

■ Close monitoring for signs of Raised ICP, Shock & repeated review
Go to Meningococcal Disease Algorithm if signs are found and consult a paediatric intensivist, anaesthetist, or intensivist
■ Perform delayed LP if no longer contraindicated BM2
■ If LP contraindicated, perform delayed LP when no longer contraindications.

Specific pathogen identified?

YES

Antibiotics for confirmed meningitis
■ Meningococcus: IV Ceftriaxone for 7 days
■ *H influenzae*: IV Ceftriaxone for 10 days
■ *S pneumoniae*: IV Ceftriaxone for 14 days, add Vancomycin if resistant strain.
■ Group B Strep: IV Cefotaxime for ≥ 14 days
■ *L monocytogenes*: IV Amoxicillin or Ampicillin for 21 days in total, plus IV Gentamicin for at least the first 7 days
■ Gram-negative bacilli: IV Cefotaxime for ≥ 21 days (unless alternative directed by local antimicrobial resistance patterns or specific sensitivities)
Unless directed otherwise by antibiotic sensitivities. Duration may be dictated by clinical response – discuss with infectious disease specialist.

NO

Antibiotics for unconfirmed meningitis

<3 months old?

YES

NO

IV Cefotaxime (or Ceftriaxone unless contraindicated BM3) + either Amoxicillin or Ampicillin IV for ≥ 14 days.

IV Ceftriaxone for ≥10 days.

Notify public health, prophylaxis see MD11 **on Meningococcal disease algorithm; Long-term management** BM7

BM1 Diagnostic and other laboratory tests:
Take bloods for Blood gas (bicarb, base deficit), Lactate, Glucose, FBC, U&E, Ca++, Mg++, PO_4, Clotting, CRP, Blood cultures, Whole blood (EDTA) for PCR, X-match. Take Throat swab. If limited blood volume, prioritise blood gas, lactate, glucose, electrolytes, FBC, clotting.

BM2 Contraindications to Lumbar Puncture
- Clinical or radiological signs of raised intracranial pressure
- Shock
- After convulsions until stabilised
- Coagulation abnormalities
  - Clotting study results (if obtained) outside the normal range
  - Platelet count below 100 x 10^9/L
  - on Anticoagulant therapy
- Local superficial infection at LP site
- Respiratory insufficiency.

Perform delayed LP in children with suspected bacterial meningitis when contraindications no longer present

BM3 Contraindications to Ceftriaxone
Premature neonates with corrected gestational age < 41 weeks and other neonates <1 month old, particularly those with jaundice, hypoalbuminaemia, or acidosis; or receiving concomitant treatment with intravenous calcium.

BM4 Indications for CT scan in children with suspected bacterial meningitis
CT scan cannot reliably detect raised intracranial pressure. This should be assessed clinically.
Perform a CT scan to detect other intracranial pathologies if GCS ≤8 or focal neurological signs in the absence of an explanation for the clinical features.
Do not delay treatment to undertake a CT scan.
Clinically stabilise the child before CT scanning.
Consult a paediatric intensivist, anaesthetist, or intensivist.

BM5 Indications for tracheal intubation and mechanical ventilation
Threatened or actual loss of airway patency (e.g. GCS ≤8, response to pain only).
- Need for any form of assisted ventilation e.g. bag–mask ventilation.
- Clinical observation of increased work of breathing
- Hypoventilation or Apnoea
- Features of respiratory failure, including
  - Irregular respiration (e.g. Cheyne–Stokes breathing)
  - Hypoxia (saturation <94% in air, PaO_2 < 13 kPa or 97.5mmHg), hypercapnoea ($PaCO_2$ > 6 kPa or 45 mmHg)
- Continuing shock following 40ml/kg of resuscitation fluid
- Signs of raised intracranial pressure
- Impaired mental status
  - GCS drop of ≥ 3, or score ≤ 8, or fluctuation in conscious level
  - Moribund state
- Control of intractable seizures
- Need for Stabilisation for brain imaging or for transfer to PICU.

Should be undertaken by a health professional with expertise in paediatric airway management, Consult PICU. (See MD4)

BM6 Repeat LP in neonates after starting treatment if:
persistent or re-emergent fever, new clinical findings (especially neurological findings), deteriorating clinical condition, or persistently abnormal inflammatory markers

BM7 Long-term management: Before discharge consider need for after care, discuss potential long-term effects with parents, arrange hearing test. Refer children with severe or profound deafness for cochlear implant assessment ASAP. Use MRF discharge checklist **http://www.meningitis.org/assets/x/56050**. Provide 'Your Guide' and direct to meningitis support organisations **www.meningitis.org/recovery** or **www.meningitisnow.org/recovery**. Offer further care on discharge as needed. Paediatrician to review child with results of their hearing test 4-6 weeks after discharge from hospital considering all potential morbidities and offer referral. Inform GP, health visitor or school nurse.

Based on NICE CG102 www.nice.org.uk/guidance/CG102

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