Meningitis Guidelines for children older than 3 months

Indication for use: Suspected meningitis in children older than 3 months of age.

Based on NICE guidelines (updated 2015).
https://www.nice.org.uk/guidance/CG102

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Signs and Symptoms

Older child
- Fever
- Nausea
- Vomiting
- Photophobia
- Headache
- Convulsions
- Kernigs +ve
- Brudzinski's +ve
- Focal neurology

Infant
- Hypothermia
- Poor feeding
- Lethargy
- Irritability
- Apnoea
- Bulging fontanelle

Specific
- Rash (blanching/ petechial)
- Leg pain
- Joint involvement
- Cold extremities

Check airway, breathing and

See **APLS recognition** guideline

Shock

See **Sepsis** guideline

Gain vascular access

Blood tests

Blood test:
- FBC
- Blood glucose
- Coagulation screen
- CRP
- Blood culture
- Blood gas
- PCR (EDTA)

Lumbar puncture

Contraindications to LP
- GCS<9
- Shock
- Respiratory insufficiency
- After convulsions until stable
- Infection at LP site
- Coagulation abnormalities
- Platelet count <100 x10^8/L

Perform delayed LP when contraindications no longer present

DO NOT DELAY ANTIBIOTICS

Ceftriaxone (see dose below)
- If recently overseas or multiple antibiotic exposure add in vancomycin
- If focal neurology/seizures or decreased GCS: add aciclovir
- If anaphylaxis to penicillin give chloramphenicol

Dexamethasone (0.15mg/kg), QDS

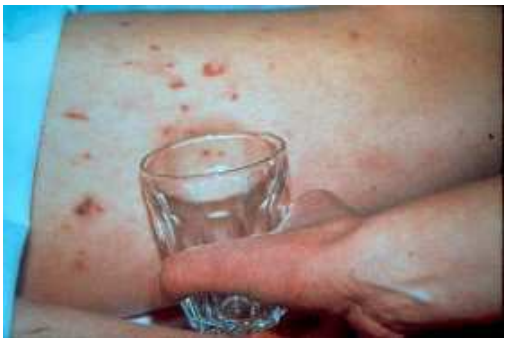
To be given in first 12 hrs from antibiotic dose if LP shows:
- Frankly purulent CSF
- CSF WBC >1000/nL
- Raised CSF WBC + protein >1g/L
- Bacteria on gram stain

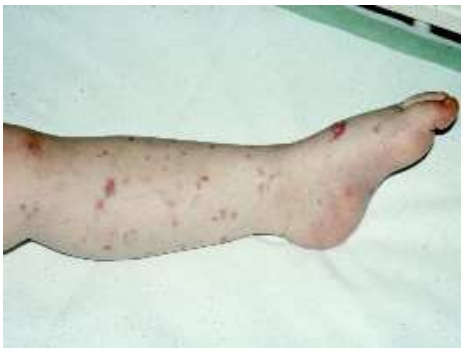
Signs and Symptoms

Common non-specific
Fever, nausea and vomiting, lethargy, unsettled/ irritable, refusing oral intake, headache, muscle ache, difficulty breathing

Common more specific
Non-blanching rash, stiff neck, altered mental state, delayed capillary refill, shock, hypotension

Infants	**Older children and adults**
Fever	Fever
Irritability/fretfulness	Joint pains and myalgia
Vomiting	Vomiting
Poor feeding	Photophobia
High-pitched cry	Severe headache
Bulging anterior fontanelle	Change in conscious level
Fits	Fits
Drowsiness	Drowsiness and confusion





Typical meningococcal rash

Diagnosis

Bloods

- Must check for WCC and CRP (although normal doesn't rule out meningitis)
- Also test for FBC, U&Es, clotting, culture and blood gas. Important to check the glucose on the blood gas as young children can become hypoglycaemic when ill.

CT Head

- Consider if clinical signs of raised intracranial pressure (GCS >9 or 3 of more drop, or focal neurological signs)
- Do not delay treatment for a CT

Lumbar Puncture

Test CSF for: WCC, Total protein, Glucose, Gram stain , Culture , Virology

Contraindications for Lumbar puncture:

- Raised ICP
- Shock
- Extensive or spreading purpura
- Convulsions (until they are stable)
- Coagulation abnormalities
- Superficial infection at the site of lumbar puncture site
- Respiratory insufficiency (can precipitate respiratory failure)

Management

Give antibiotics early! Do not delay antibiotics for lumbar puncture.

Treat with IV ceftriaxone:

- 80mg/kg once a day for up to 50kg
- Above 50kg 2-4g once a day

H.influenzae type b meningitis treat for IV ceftriaxone for 10 days total.
S pneumoniae meningitis treat with IV ceftriaxone for 14 days total.
(Unless directed otherwise by the results of antibiotic sensitivities.)

If patient has been out of the UK for more than 3 months or has had multiple recent courses of antibiotics add in Vancomycin:

- 15mg/kg every 8 hours adjusted to plasma-concentration monitoring.
- Maximum of 2g per day

Dexamethasone has been shown to reduce the incidence of deafness following bacterial meningitis infection. Give dexamethasone (0.15mg/kg to a maximum dose of 10mg, QDS) if the lumbar puncture reveals any of the following:

- Frankly purulent CSF
- CSF WBC count greater than 1000/microliter
- Raised CSF WBC count with protein concentration greater than 1g/litre
- Bacteria on gram stain

Dexamethasone should be given before or with the first dose of antibiotics. If this is missed and it is indicated then try to administer the first dose within 4 hours of starting antibiotics. Do no start dexamethasone more than 12 hours after starting antibiotics.

Medication	**Dose**
Ceftriaxone	<50kg 80mg/kg once a day >50kg 2-4g once a day
Vancomycin	15mg/kg every 8 hours (max 2g/ day)
Dexamethasone	0.15mg/kg every 6 hours (maximum dose 10mg)

Fluids (see also Intravenous Fluids Guideline)

Resuscitation

- If clinically in shock and requiring resuscitation give intravenous glucose-free crystalloid fluids (such as sodium chloride 0.9%).
- Give as bolus of 20ml/kg over 10 minutes, and reassess after the bolus.
- Consider underlying cardiac or renal disease and a small bolus of 10ml/kg may be required.

Fluid Deficit

Mild (<4%)	Moderate (4-6%)	Severe (>7%)
No clinical symptoms	Delayed capillary refill >2 seconds	Very delayed capillary refil > 3 seconds
	Increased respiratory rate	Other signs of shock
	Mildly decreased skin turgor	Decreased skin turgor
	Sunken eyes	
	Skin colour unchanged	Pale/ mottled skin
	Warm extremities	Cold extremities
	Normal peripheral pulses	Weak peripherial pulses
	Letheragic	Unresponsive
	Normal BP	Hypotensive

Deficit in mls can be calculated following an estimation of the degree of the dehydration. For example a 10kg child who is 5% dehydrated has a water deficit of 500mls. Fluids should be replaced over 24-48 hours, and should be adjusted based on the on-going assessment of the child.

Maintenance

- Give full volume maintenance fluids, the formula for working out maintenance is written in the paediatric drug charts using the Holliday–Segar formula. Maximum of 2500ml for males and 2000mls for females.

- Full volume maintenance should be an isotonic solution such as 0.9% sodium chloride with 5% dextrose and 10 mmols of potassium (if potassium is within normal limits.)

- Restrict to 80% of maintenance if severe illness, hyponatraemia or raised ICP.

- Monitor U&Es and glucose in children require IV fluids at least once a day whilst they are being given IV fluids. Consider on-going losses for these children, see diagram below.

- Replace any electrolyte disturbances.

- Measure urine and plasma osmolalities daily whilst ill, and closely monitor urine output.

Notifying

- Public health England must be informed of all cases of suspected meningitis so they can arrange for prophylaxis for close contacts.
- Meningococcal meningitis: close contacts are treated with ciprofloxacin as a single dose, regardless of age.
- Haemophilius influenzae: close contacts under the age of 10 are treated with rifampicin orally once a day for 4 days.
- Inform the child's GP, health visitor and school nurse about the diagnosis

Discharge and follow up

- Consider their requirements for follow-up, taking into account potential sensory, neurological, psychosocial, orthopaedic, cutaneous and renal morbidities, and discuss potential long-term effects of their condition and likely patterns of recovery with the child or young person and their parents or carers, and provide them with opportunities to discuss issues and ask questions.
- Perform audiology preferably before discharge or within 4 weeks of being fit to test.
- They should be assessed by a paediatrician at their next available clinic following discharge.
- Referral to Dr Reynold's (neuro-developmental consultant) for confirmed cases of bacterial meningitis in infants.