

Meningitis (Bacterial) and Meningococcal Septicaemia

Definition / Supporting Information

Bacterial meningitis is an infection of the surface of the brain (meninges) by bacteria that have usually travelled there from mucosal surfaces via the bloodstream. Meningococcal septicaemia, or blood poisoning, occurs when the bacteria in the blood multiply uncontrollably. This is a medical emergency.

- Meningococcal disease can appear as meningococcal meningitis or meningococcal septicaemia, or a combination of both.
- See Bacterial meningitis and meningococcal septicaemia: Management of bacterial meningitis and meningococcal septicaemia in children and young people younger than 16 years in primary and secondary care [[NICE clinical guideline 102](#)]

Keywords / also known as: bacterial infection, non-blanching rash

Essential History

Evaluation should progress only after the ABCs (airway, breathing, and circulation) of resuscitation have been addressed.

Ask about:

- The level of parental or carer concern (compared with previous illness in the child or young person or their family)
- Duration and speed of progression of symptoms
- Foreign travel

'Red Flag' Symptoms and Signs

Evaluation should progress only after the ABCs (airway, breathing, and circulation) of resuscitation have been addressed.

See Symptoms and signs of bacterial meningitis and meningococcal septicaemia [[NICE clinical guideline 102, section 1, table 1](#)].

Ask about:

- Fever / chills / shivering
- Nausea / vomiting / abdominal pain / diarrhoea
- Lethargy
- Irritability
- Refusal of food and/or drink
- Headaches

- Muscle ache (see Extremity Pain) / joint pain
- Respiratory / ear, nose, throat symptoms
- Rash
- Leg pain
- Photophobia
- Seizures

Look for:

- 'Ill appearance'
- Non-blanching rash (see Figures 1-3)
- Stiff neck
- Altered mental state
- Capillary refill time more than 2 seconds
- Unusual skin colour
- Cold hands / feet
- Shock
- Hypotension
- Back rigidity
- Bulging fontanelle
- Kernig's sign (pain on straightening leg when hip and knee flexed)
- Brudzinski's sign (neck flexion causing hip and knee flexion)
- Focal neurological deficit including cranial nerve involvement and abnormal pupils
- Abnormal 'doll's eye' movements



Figure 1: Petechial and purpuric rashes - Example 1



Figure 2: Petechial and purpuric rashes - Example 2



Figure 3: Petechial and purpuric rashes - Example 3

Differential Diagnosis

- Viruses
 - Varicella zoster virus
 - Herpes simplex meningo-encephalitis
 - Cytomegalovirus (congenital infection)
 - Coxsackie virus
 - Rubella virus
 - Measles virus
- Bacteria
 - *Mycoplasma pneumoniae*
 - *Streptococcus pyogenes* (scarlet fever)
 - *Streptococcus pneumoniae*
 - Enterococcal and viridans group streptococci (endocarditis)
 - Tuberculous meningitis
- Non-infectious causes of purpuric or petechial rash
 - Henoch–Schönlein purpura
 - Immune thrombocytopenic purpura
 - Kawasaki Disease*
 - Serum sickness
 - Poisons (See Drug Overdose and Poisoning)
 - Erythema multiforme
 - Erythema nodosum
 - Systemic lupus erythematosus
 - Benign petechial rash, eg, in region of superior vena cava

* In any child, especially infants < 1 year, presenting with persistent high fever and no obvious cause, even if with few or no other Kawasaki Disease symptoms, it is important to continue to consider Kawasaki Disease even when meningitis or other infections are suspected and a treatment plan advances to address this.

Where no improvement has occurred within 24 hours, the differential diagnosis must be reconsidered to include Kawasaki Disease as a potential diagnosis.

Investigations

Evaluation should progress only after the ABCs (airway, breathing, and circulation) of resuscitation have been addressed.

See Bacterial meningitis and meningococcal septicaemia [[NICE clinical guideline 102, section 1](#)].

To be undertaken by non-specialist practitioners (eg, General Practitioner (GP) Team):

- Arrange emergency transfer of children and young people with suspected bacterial meningitis or suspected meningococcal septicaemia to secondary care.
- Give parenteral antibiotics (intramuscular or intravenous benzylpenicillin sodium or ceftriaxone) at the earliest opportunity, but do not delay urgent transfer to hospital.

To be undertaken by specialist practitioners (eg, Paediatric / Paediatric Emergency Department Team(s)) if not already done:

- Full blood count
- C-reactive protein (CRP)
- Coagulation screen
- Blood culture
- Whole-blood polymerase chain reaction (PCR) for *Neisseria meningitidis*
- Blood glucose
- Blood gas
- In children and young people with suspected meningitis, perform a lumbar puncture unless any of the following contraindications are present:
 - Signs suggesting raised intracranial pressure
 - Reduced or fluctuating level of consciousness (Glasgow Coma Scale score less than 9 or a drop of 3 or more)
 - Relative bradycardia and hypertension
 - Focal neurological signs
 - Abnormal posture or posturing
 - Unequal, dilated, or poorly responsive pupils
 - Papilloedema
 - Abnormal 'doll's eye' movements
 - Shock
 - Extensive or spreading purpura
 - After convulsions until stabilised
 - Coagulation abnormalities
 - Coagulation results (if obtained) outside the normal range
 - Platelet count below $100 \times 10^9/L$
 - Receiving anticoagulant therapy
 - Local superficial infection at the lumbar puncture site
 - Respiratory insufficiency
 - Lumbar puncture is considered to have a high risk of precipitating respiratory failure in the presence of respiratory insufficiency.

Treatment Approach

Evaluation should progress only after the ABCs (airway, breathing, and circulation) of resuscitation have been addressed.

To be undertaken by non-specialist practitioners (eg, GP Team):

- Arrange emergency transfer to hospital
- Give parenteral antibiotics (intramuscular or intravenous benzylpenicillin sodium or ceftriaxone) at the earliest opportunity, but do not delay urgent transfer to hospital to give the parenteral antibiotics.

To be undertaken by specialist practitioners (eg, Paediatric / Paediatric Emergency Department Team(s)):

See Management in secondary care [[NICE clinical guideline 102, section 1.4](#)].

- Treat children and young people aged ≥ 3 months with suspected bacterial meningitis without delay, using intravenous ceftriaxone for 10 days.
- Treat children younger than 3 months with suspected bacterial meningitis without delay, using intravenous cefotaxime plus either amoxicillin or ampicillin for 14 days.
 - Ceftriaxone may be used as an alternative to cefotaxime (with or without ampicillin or amoxicillin), but be aware that ceftriaxone should not be used in premature babies or in babies with jaundice.
- Treat children and young people with suspected bacterial meningitis who have recently travelled outside the UK or have had prolonged or multiple exposure to antibiotics (within the past 3 months) with vancomycin, in addition to the above antibiotics.
- If tuberculous meningitis is part of the differential diagnosis, use antibiotic treatment appropriate for tuberculous meningitis in line with Tuberculosis [[NICE clinical guideline 117](#)].
- In children and young people with suspected or confirmed meningococcal septicaemia, anticipate, monitor, and correct the following metabolic disturbances, using local or national protocols:
 - Hypoglycaemia
 - Hypokalaemia
 - Hypocalcaemia
 - Hypomagnesaemia
 - Acidosis
 - Hyponatraemia due to SIADH (syndrome of inappropriate antidiuretic hormone secretion)
 - Anaemia
 - Coagulopathy
- If present, correct dehydration using enteral fluids or feeds, or intravenous isotonic fluids (eg, sodium chloride 0.9% with glucose 5%).

- Do not restrict fluids unless there is evidence of:
 - Raised intracranial pressure, **or**
 - Increased antidiuretic hormone secretion
- Use enteral feeds as maintenance fluid, if tolerated.
- If intravenous maintenance fluid is required, use isotonic fluids (eg, sodium chloride 0.9% with glucose 5%).
 - In neonates, use glucose 10% with added sodium chloride for maintenance, and monitor blood glucose levels.
- Give dexamethasone for suspected or confirmed bacterial meningitis in children ≥ 3 months, as soon as possible.
 - 150 micrograms/kg (max. 10 mg) every 6 hours for 4 days starting before or with the first dose of antibiotic
 - Ideally give before 4 hours but not later than 12 hours after starting antibiotics
 - Dexamethasone to be given if lumbar puncture shows any of the following:
 - Frankly purulent cerebrospinal fluid (CSF)
 - CSF white blood cell count $> 1000/\mu\text{L}$
 - Raised CSF white blood cell count with protein concentration $> 1 \text{ g/L}$
 - Bacteria on Gram stain
 - Do not use dexamethasone or any other corticosteroids in children younger than 3 months with suspected or confirmed meningitis.

When to Refer

Refer (arrange emergency transfer) any case of suspected bacterial meningitis or suspected meningococcal septicaemia to specialist practitioners (eg, Paediatric / Paediatric Emergency Department / Paediatric Intensive Care Team(s)).

Escalate care to Paediatric Intensive Care Team if:

- Shock persists despite 40 mL/kg of intravenous fluid resuscitation
- Threatened loss of airway patency
- Reduced or fluctuating level of consciousness (Glasgow Coma Scale score less than 9 or a drop of 3 or more)
- Intractable seizures
- There is a need for stabilisation and management to allow brain imaging or transfer to the paediatric intensive care unit or another hospital

‘Safety-Netting’ Advice

- If the child or young person is assessed as being at low risk of meningococcal disease and is discharged after initial observation, advise parents or carers to return to hospital if the child or young person appears to them to be ill.

- In children and young people who present with a non-spreading petechial rash (see Figures 1-3) without fever (or history of fever), and who do not appear ill to a healthcare professional, meningococcal disease is unlikely, especially if the rash has been present for more than 24 hours, consider:
 - Other possible diagnoses
 - Performing a full blood count and coagulation screen

Patient / Carer Information

****Please note: whilst these resources have been developed to a high standard they may not be specific to children.***

- [Meningitis](#) (Web page), the NHS website
- [What are meningitis and septicaemia?](#) (Web page), Meningitis Research Foundation

Resources

National Clinical Guidance

European Society of Clinical microbiology and infectious diseases (ESCMID) guideline: Diagnosis and treatment of acute bacterial meningitis [[Pubmed](#)]

[Meningitis \(bacterial\) and meningococcal septicaemia in under 16s: recognition, diagnosis and management](#) (Web page), NICE clinical guideline CG102, National Institute for Health and Care Excellence

[Meningitis \(bacterial\) and meningococcal septicaemia in children and young people](#) (Web page), NICE quality standard QS19, National Institute for Health and Care Excellence

[Management of invasive meningococcal disease in children and young people](#) (Web page) SIGN guideline 102, Scottish Intercollegiate Guidelines Network (archived)

Suggested Resources

****Please note: these resources include links to external websites. These resources may not have national accreditation and therefore PCO UK cannot guarantee the accuracy of the content.***

[Meningitis](#) (Web page), Meningitis Now

[Meningococcal](#) (Web page), Public Health England's Green Book

[Pain Management](#) (eLearning - requires log-in), RCPCH Compass

[Fever](#) (Web page - log-in required), Spotting the Sick Child

[TEMPERS! Awareness Raising Leaflet \(PDF\)](#), Societi

[Time to 'Think Kawasaki Disease'](#) (Webinar), Royal College of Paediatrics and Child Health

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