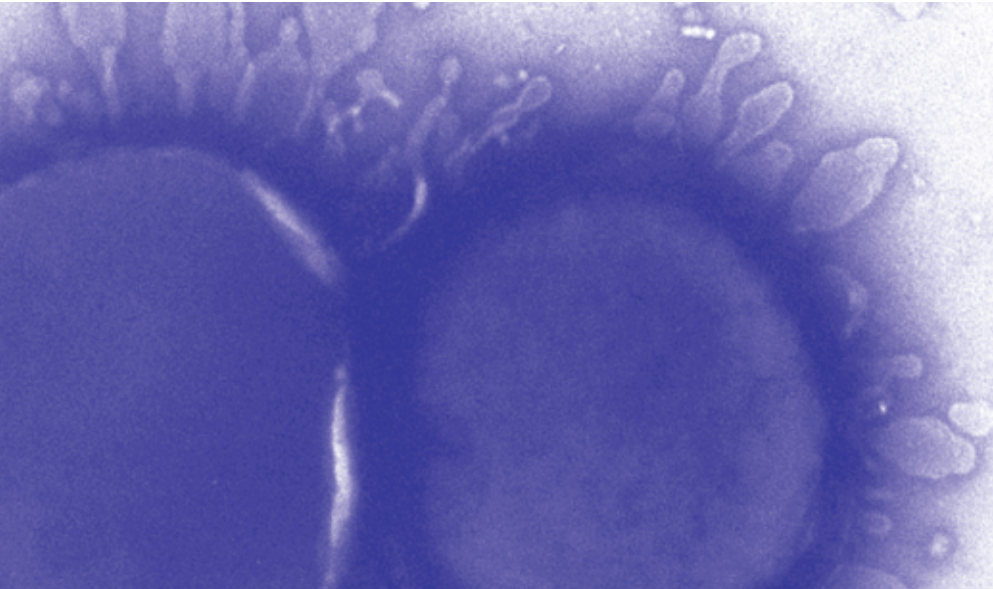


Meningococcal Meningitis and Septicaemia

Guidance Notes



Diagnosis and Treatment in General Practice

Meningococcal disease can kill a healthy person of any age within hours of the first symptoms

The disease is uncommon, but remains the leading infectious cause of death in UK children¹ despite the success of the meningococcal C vaccine. One in five survivors experiences reduced quality of life² and approximately one in seven survivors has neurological or sensory disability, amputation or tissue loss, or other lifelong sequelae³. It is more prevalent in winter and may follow outbreaks of influenza⁴. The risk is highest in children under five and adolescents and is increased by contact with a case⁵.

Distinguishing early meningococcal disease from self-limiting illness

Meningococcal disease is a rapidly evolving illness, requiring urgent treatment. The rate at which the disease develops varies between patients. Those with more fulminant illness will be critically ill within the first 24 hours, leaving a very narrow window of opportunity to deliver life-saving treatment.

However, if a patient is seen during the early, **prodromal phase** of meningitis or septicaemia it may be impossible to distinguish them from someone with a milder self-limiting illness⁶. For this reason, it is important to provide a **'safety net'** when a patient with a non-specific febrile illness is seen in primary care¹.

Safety net: The SIGN guideline on Meningococcal Disease in Children and Young People⁷, and the NICE guideline on Feverish Illness in Children¹ highlight the importance of a safety net when a febrile child is sent home. This includes:

- Encouraging the parent/patient to trust their instincts and seek medical help again if the illness gets worse, even if this is shortly after the patient was seen^{6,1,7} and advising on accessing further healthcare.
- Information about symptoms of serious illness, including how to identify a non-blanching rash¹, and the Tumbler Test⁹ (see back page to order free patient information). Rash is the commonest reason for people with meningococcal disease to seek medical help⁹.

It may also be necessary to:

- Suggest follow up within a specified period (usually within 4 to 6 hours^{6,7}), and
- Ensure that the parent/patient understands how to get medical help after normal working hours: sometimes a GP may want to liaise directly with other health care professionals if s/he has concerns about a patient who is not being sent to hospital.

Safety net arrangements should take account of the parent's anxiety and capacity to manage the situation¹ as well as proximity to the surgery and to out of hours and emergency care, and any individual problems with access or transport⁷.



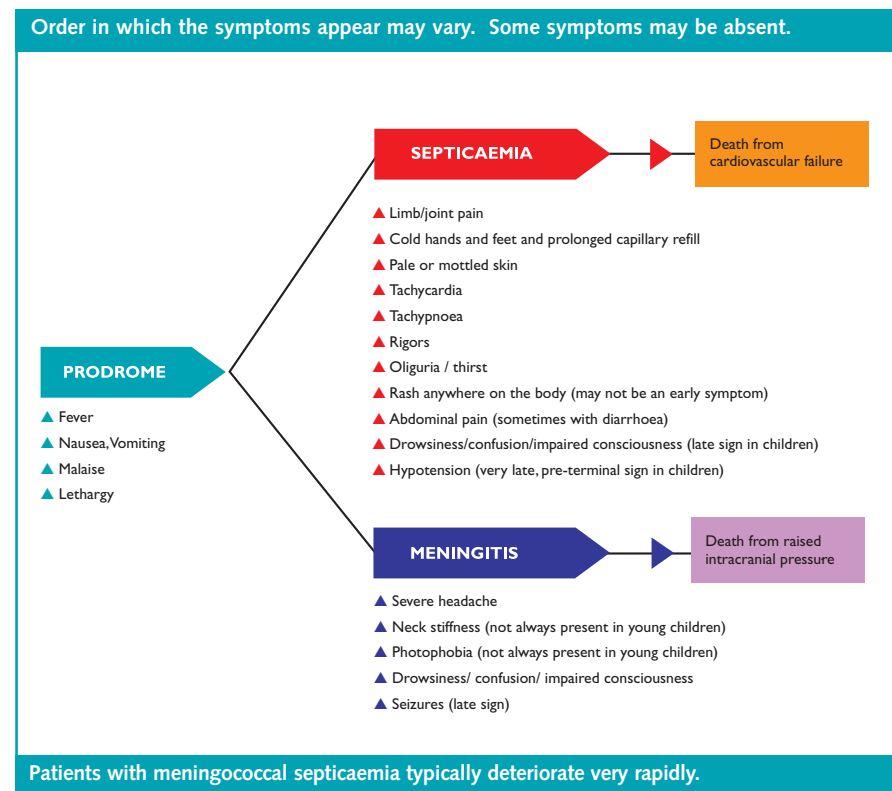
Press the tumbler firmly against the skin to see if the rash blanches/fades

Disease Pathway

Meningococcal disease has two main clinical presentations: meningitis and septicaemia, which often occur together. Septicaemia is more common and more dangerous. It is most likely to be fatal when it occurs without meningitis¹⁰.

A patient with septicaemia presents with very different symptoms from someone with meningitis.

This diagram illustrates the development of symptoms and signs at the far ends of the spectrum of meningococcal disease. It is important that the signs of underlying meningitis or septicaemia are looked for in all febrile patients without an obvious cause for fever, and patients who are currently afebrile who have a history of fever. Advanced meningococcal disease can be missed if the following signs are not looked for. The perceptions and concerns of parents and patients should be taken seriously¹.



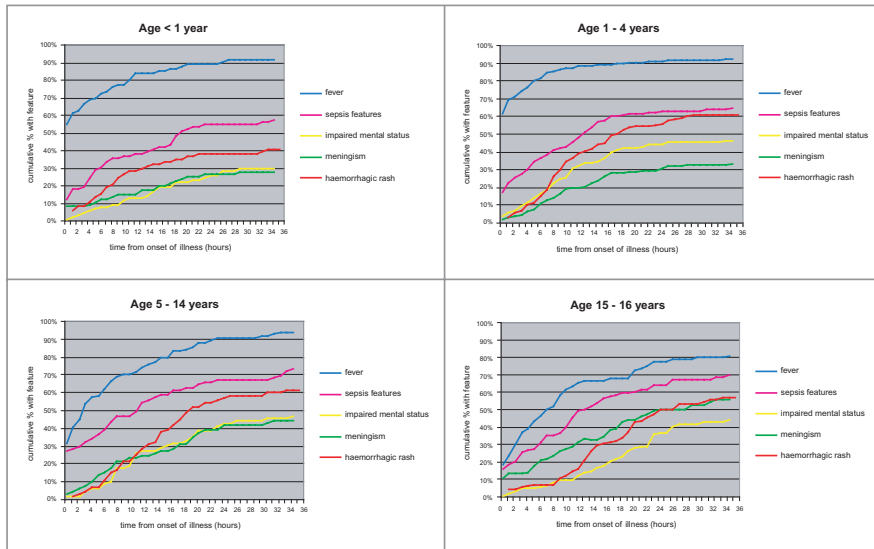
BABIES MAY ALSO SHOW THE FOLLOWING SYMPTOMS:

- Poor feeding
- Irritable particularly when handled, with a high pitched or moaning cry
- Abnormal tone, either increased or decreased, or abnormal posturing
- Vacant staring, poorly responsive or lethargic
- Tense fontanelle
- Cyanosis.

Development of Symptoms

A recent, national study⁶ found that almost 50% of children presenting to GPs with meningococcal disease were sent home on their first visit and that these children were more likely to die. This was the largest study of its kind – unique in investigating how children and adolescents with meningococcal disease present to primary care. The aim was to find out whether there were key early symptoms, which if recognised at an early stage, could bring about earlier treatment and improved outcome.

The study found that the first symptoms reported by parents of children with meningitis and septicaemia were common to many self-limiting viral illnesses. This **prodromal phase** lasted up to 4 hours in young children but as long as 8 hours in adolescents, followed by the more specific and severe symptoms of meningitis and septicaemia, see figure below.



Red Flag Symptoms – Early Septicaemia

In all age groups, signs of septicaemia and circulatory shut-down were next to develop – 72% of children had **limb pain, pale or mottled skin, or cold hands and feet** at a median time of 8 hours from onset of illness. Parents of younger children also reported **drowsiness, rapid or laboured breathing**, and sometimes diarrhoea. **Thirst** was reported in older children.

Classic Symptoms

The first classic symptom was **rash**, which appeared at 8-9 hours (median time) in babies and young children, but later in older children. Although not always present, it was the most common classic feature of meningococcal disease. Meningitis symptoms (**neck stiffness, photophobia, bulging fontanelle**) appeared later – 12 to 15 hours from onset. They were more common in older children and were not reliable signs in children under age 5.

Late features such as confusion/delirium/impaired consciousness eventually developed in nearly half of children, while seizures and coma were uncommon. They occurred 15 to 24 hours from disease onset.

The study concluded that recognising the '**red flag**' symptoms of early septicaemia could reduce the proportion of cases missed at first consultation by about half. As children were admitted a median of 19 hours from disease onset, recognising these symptoms could bring forward diagnosis by as much as 11 hours.

Clinical Tests for Doctors

1. The Rash



Scanty petechial rash



Classic purpuric rash

Most patients with meningococcal septicaemia develop a rash - it is one of the clearest and most important signs to recognise. However, in meningitis the rash can be very scanty or even absent.

Although the majority of children seen in primary care with petechial rashes will not have meningococcal disease¹¹, it is very important to look for the rash, and a non-blanching rash should therefore be treated as an emergency^{1,7}.

Non-blanching rash is classified as '**red**' in the **NICE traffic-light system** for assessing feverish children. A child seen in primary care with any '**red**' features should be urgently referred to a paediatric specialist¹.

Ask parents about any new rashes or marks on their child's skin. Note that parents may not realise that meningococcal lesions are a 'rash', as they associate the word rash more with a pink measles-like rash. They may use other words to describe the rash, for example bruise, spot, freckle, blister, stain or mark on the skin.



Early, balancing maculopapular rash with isolated petechiae

In the early stages the rash may be blanching and maculopapular, but it nearly always develops into a non-blanching red or brownish petechial rash or purpura. Isolated pinprick spots may appear where the rash is mainly maculopapular, so examining the whole skin surface is worthwhile¹².

This is best done in good lighting, searching the entire body for small petechiae, especially in a febrile child with no focal cause.



Purpuric rash on dark skin



Petechial rash on conjunctivae

Courtesy D. A. Warrell

The rash can be more difficult to see on dark skin, but may be visible in paler areas, especially the soles of the feet, palms of the hands, abdomen, or on the conjunctivae or palate.

A rapidly evolving petechial or purpuric rash is a sign of very severe disease.

About 60% of children with meningococcal disease have a rash when seen by their GP⁶. The underlying meningitis or septicaemia may be very advanced by the time a rash appears, as the rate the rash develops varies between patients. If a typical non-blanching rash is absent in a feverish or ill child, it is important to look for early signs of septicaemia and signs of meningitis.

2. Early Signs of Septicaemia and Advancing Shock

Early signs of circulatory shutdown include **pale or mottled skin**, and **cold hands and feet** due to vasoconstriction and prolonged capillary refill, **tachycardia**, and **fast or laboured breathing**.

The NICE Guideline on Feverish Illness in Children¹ specifies that temperature, heart rate, respiratory rate and capillary refill time should be routinely measured and recorded in all feverish children aged under five. A respiratory rate of >60 breaths/minute is classified as 'red' in the NICE traffic-light system, requiring urgent referral to a paediatric specialist. NICE classifies children with RR >50 at 6-12 months of age or RR >40 at >1 year of age to be at intermediate risk of serious illness: they should be assessed face-to-face and their need for paediatric care considered. A raised heart rate can be a sign of serious illness, particularly septic shock¹.

Normal Values of Vital Signs

From Advanced Paediatric Life Support Manual¹³

Age (years)	Heart Rate per minute	Respiratory Rate per minute	Systolic Blood Pressure
<1	110-160	30-40	70-90
1-2	100-150	25-35	80-95
2-5	95-140	25-30	80-100
5-12	80-120	20-25	90-110
over 12	60-100	15-20	100-120

Check capillary refill by pressing for 5 seconds on the big toe or a finger, or on the sternum, and count the seconds it takes for colour to return. Capillary refill time ≥ 3 seconds signals intermediate risk of severe infection¹, and when prolonged to ≥ 4 seconds on peripheries, especially with raised heart and respiratory rates, suggests shock.

Check oxygen saturation (if pulse oximeter is available): normal value is >95% in air.

Hypotension is an important sign in adults, but it is a late and ominous sign in children, which limits its diagnostic value. Children and adolescents can compensate for shock and maintain normal blood pressure until septicaemia is far advanced.

In conjunction with other signs, postural hypotension in adults may suggest shock.

3. Conscious Level

This can be assessed by checking AVPU:

Alert? Responds to Voice? Responds to Pain? Unresponsive?

Drowsiness/impaired consciousness in children with septicaemia is a late and grave prognostic sign and indicates immediate action.



Even severely shocked children can still be alert and communicative.

4. Neck Stiffness

True neck stiffness can be assessed by checking whether a patient can kiss their knees, or by assessing the ease of passive flexion in a relaxed patient. Neck stiffness signifies meningitis, but is absent in septicaemia. It is not common in young children even with meningitis, so the absence of neck stiffness in a febrile child is **NEVER** reassuring.

5. Other Important Features of Meningitis

- Children are likely to be poorly responsive, staring, difficult to wake. Parents may report drowsiness or poor eye contact, and parental anxiety about their child's state of responsiveness should be taken seriously.
- Babies are often irritable with a high-pitched cry, and may be stiff and jerky or else floppy and lifeless.
- Adolescents and adults may appear aggressive or combative.
- Persistent vomiting may be seen at any age.

Factors that may confuse diagnosis and delay recognition

- purpuric areas which look like bruises can be confused with injury or abuse;
- disorientation/impaired consciousness can be confused with drug or alcohol intoxication¹⁴;
- isolated limb or joint pain is a well-established sign of meningococcal septicaemia^{6,15} - children have been mis-diagnosed with fractures due to the intensity of the pain;
- maculopapular rashes are often dismissed as being viral in origin;
- URTI does not exclude meningitis or septicaemia.

Treatment and further action

Antibiotic Therapy

If meningococcal infection is suspected, the patient should be transferred to hospital by quickest means of transport, usually emergency ambulance, and parenteral antibiotics should be given at the earliest opportunity^{16,17,17} usually while arranging transport to hospital. Urgent transfer to hospital is the key priority.

The evidence on effectiveness of pre-hospital antibiotics is inconclusive, because disease severity is a confounding factor^{18,19}. The SIGN guideline⁷, the NICE fever guideline¹, and the current CMO recommendation¹⁶ advise giving parenteral antibiotics for suspected meningococcal disease at the pre-hospital stage.

Antibiotics can be administered IV, IM, or IO. IM antibiotics should be given as proximally as possible, into a part of the limb that is still warm (the cold area being more poorly perfused).

Choice of antibiotic: Pre-hospital administration of benzylpenicillin has been recommended since 1988²⁰, and expert guidelines¹⁷ continue to recommend that all GPs carry it and inject it unless there is a history of immediate allergic reactions after previous penicillin administration. GPs do not need to carry alternative antibiotics¹⁷, but third generation cephalosporins¹ (cefotaxime rather than ceftriaxone for first line use in meningococcal septicaemia^{7,21}) and chloramphenicol¹⁷ are recommended alternatives if available.

Benzylpenicillin dosage (BNF)²²

(except in severe penicillin allergy)
Adult and child aged 10 or older: **1200 mg**
Child 1-9 years: **600 mg**
Infant: **300 mg**

Paramedics have the mandate to give benzylpenicillin for suspected meningococcal septicaemia with a non-blanching rash²³, and the Joint Royal Colleges Ambulance Liaison Committee²⁴ and Meningitis Research Foundation have collaborated to produce a guideline for paramedics on this (see back page).

Supportive Treatment (if facilities are available)

If a patient is unconscious, airways management should be implemented. Oxygen should be administered, particularly when the respiratory rate is raised, suggesting shock or pulmonary oedema.

Rapid heart rate, poor capillary refill time and cold extremities suggest hypovolaemia and IV fluids should be administered to prevent circulatory collapse. This should not delay antibiotic therapy or transport to hospital.

Transfer to Hospital

The patient should be transferred to hospital by the quickest means of transport, usually 999 ambulance. Ambulance control and hospital staff need to know the diagnosis, whether the patient has a non-blanching rash, and especially whether there are serious prognostic signs such as a rapidly evolving rash, shock, or impaired conscious level. A GP referring a patient to hospital should contact the on-call paediatrician/emergency personnel so that they can expect this patient.

Case Notification

The doctor who suspects a diagnosis of meningitis or meningococcal septicaemia in the UK has a legal duty to notify the case to the local Consultant in Communicable Disease Control (CCDC) or Consultant in Public Health Medicine (CPHM) or the on-call Public Health Specialist. This is usually done by the hospital, but GPs may wish to check that it has been done.

Dealing with Patient Contacts¹⁷

The CCDC or CPHM is responsible for ensuring that intimate and household contacts of a patient with meningococcal disease who require antibiotic prophylaxis are prescribed rifampicin, ciprofloxacin or ceftriaxone. This is restricted to those contacts identified by public health. The purpose of chemoprophylaxis is to eliminate carriage in the contact group, it does not prevent illness in those already incubating the bacteria, so contacts should continue to be alert to the possibility of meningococcal disease, and given a leaflet to help them recognise the symptoms (see back page to order free patient information).

Follow up care for survivors

Although most people recover well, there is a wide range of possible long term sequelae:

- hearing loss and other sensory disabilities
- neurological damage including learning, motor and neuro-developmental deficits and epilepsy
- orthopaedic damage including amputation, growth plate damage and arthritis
- post necrotic tissue/skin loss requiring reconstructive surgery
- renal impairment or chronic damage to other organ systems
- psychiatric and behavioural problems including post-traumatic stress disorder.

Patients who survive meningococcal disease require follow-up and need to be thoroughly assessed for any long-term complications.

This should include hearing assessment¹⁷: children should have their hearing tested as soon as possible, but within 4 weeks of being fit to test²⁵ (post-meningitis ossification of the inner ear occurs rapidly and can prevent or limit successful cochlear implantation in those with profound hearing loss²⁶). Hearing tests may need to be repeated and may require referral from general practice.

Psychological follow up is important as children may have difficulty readjusting after discharge, particularly those treated on PICU²⁷. Early referral to Child and Adolescent Mental Health Services may be necessary. Parents as well as children may be prone to post-traumatic stress disorder²⁷.

In some cases, sequelae do not become evident until years after the illness, long after routine follow up has ceased:

- learning impairment and coordination difficulties are sometimes only noticed when children reach school age
- distorted bone growth due to growth plate damage may take years to become apparent²⁸

In such cases, children need referral from their GP for assessment and follow up care.

Meningitis Research Foundation offers in-depth information, befriending and support to families and individuals affected, see back page for details.

This booklet was written with the help of a panel of experts in meningococcal disease representing a broad range of clinical experience including general practice, paediatrics, emergency medicine, public health and infectious diseases, as well as responses to a pilot version from GPs across the country. This 2008 update was produced with the help of Dr Nelly Ninis, Dr Martin Richardson and Dr Matthew Thompson.

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How Meningitis Research Foundation can help

Meningitis Research Foundation is a national registered charity that funds research to prevent meningitis and septicaemia, and to improve survival rates and outcomes. The Foundation promotes education and awareness, and supports people affected.

Based on research and consultation, the charity produces guidance notes and algorithms to promote best practice in recognition and treatment of these diseases. These include:

- **Vital Signs, Vital Issues: Recognition and Prevention of Meningitis and Septicaemia** to help community practitioners demystify vaccines
- **Meningococcal Septicaemia: Identification and Management for Ambulance Personnel** as well as resources for health professionals working in hospitals.

The Foundation also produces

- **Symptoms** information: **Baby Watch, Tot Watch, Get it Sussed, Race Against Time** for people in the age groups most at risk, and their parents.
- **Am I at Risk?** a leaflet about what happens when there is a case in the community
- **Holly's Story** a DVD for health promotion activities
- **Meningitis – Know the Symptoms and Protect Your Family** written and audio information (mp3) about symptoms and immunisation in 22 languages.

Freephone 24 hour helpline 080 8800 3344

Helpline staff respond to calls at any hour of the day or night, from people who want help and information, or a listening ear. Through the Helpline, the charity offers support, including home visits and a one-to-one befriending service to patients and their families whether they are currently ill, recovering, managing after effects, or bereaved. An interpretation service is available in 150 languages.

The charity also produces information for people affected and those who care for them, including **Meningitis and Septicaemia – What Happens Next?** explaining the complications of meningitis and septicaemia.

All of the charity's materials, can be obtained free of charge by calling any of our offices, or through our website:

www.meningitis.org

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