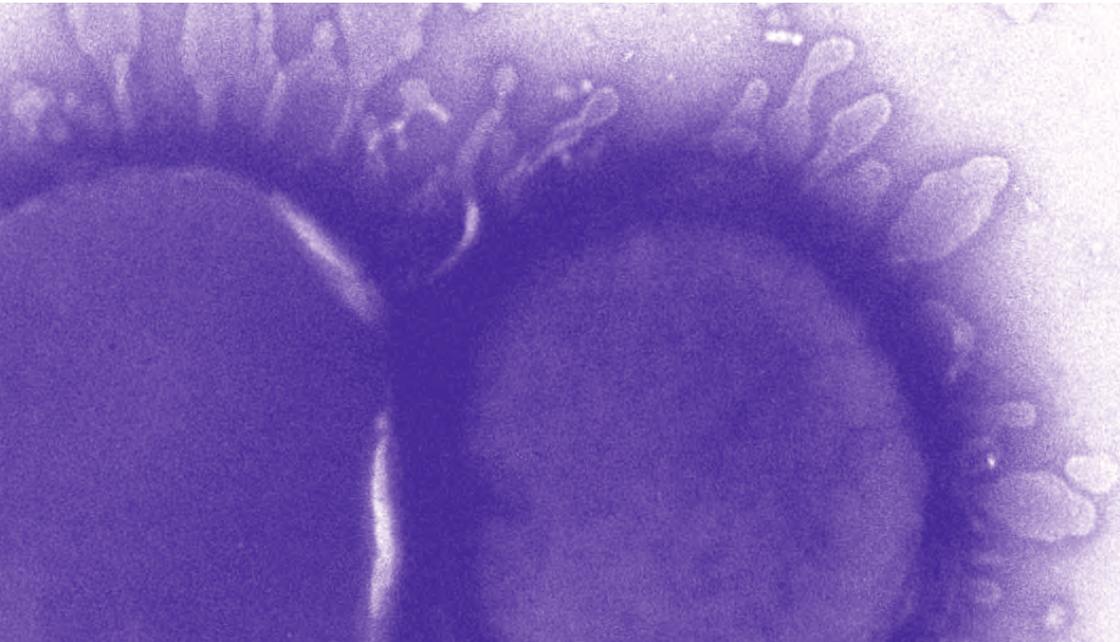


Meningococcal Meningitis and Septicaemia

Guidance Notes



Diagnosis and Treatment in General Practice

Updated in line with NICE Bacterial Meningitis and Meningococcal Septicaemia CG102, NICE Sepsis: recognition, diagnosis and early management CG51, SIGN Meningococcal Disease Guideline 102 and NICE Feverish Illness in Children CG160

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 children^{1,2} despite the success of the meningococcal C vaccine. Over one third of survivors will have one or more clinically significant deficits in physical, cognitive, and psychological functioning and around one in ten will be left with major sequelae such as deafness, amputations and brain damage³. 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 care².

Safety net: The NICE guideline on Feverish Illness in Children³, NICE guideline on Sepsis⁷ and the SIGN guideline on Meningococcal Disease in Children and Young People⁸ 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^{2,7,8} and advising on accessing further healthcare.
- Information about symptoms of serious illness, including how to identify a non-blanching rash, and the Tumbler Test² (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^{7,8}), 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 situation² as well as proximity to the surgery and to out of hours and emergency care, and any individual problems with access or transport⁸.



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

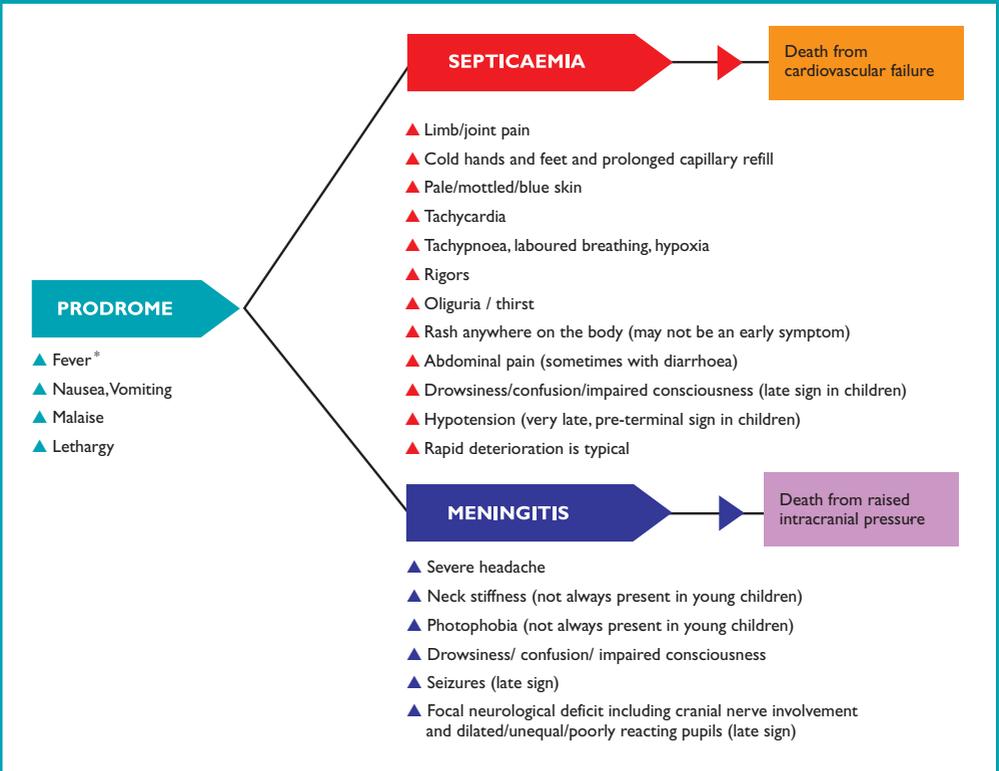
Disease Pathway

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 can present 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. Consider the level of parental concern, particularly compared with previous illnesses¹. The perceptions of parents and patients should be taken seriously².

Consider meningococcal disease in patients who present with the following symptoms and signs¹.



Order in which the symptoms appear may vary. Some symptoms may be absent.

*fever is often absent in babies less than 3 months of age.

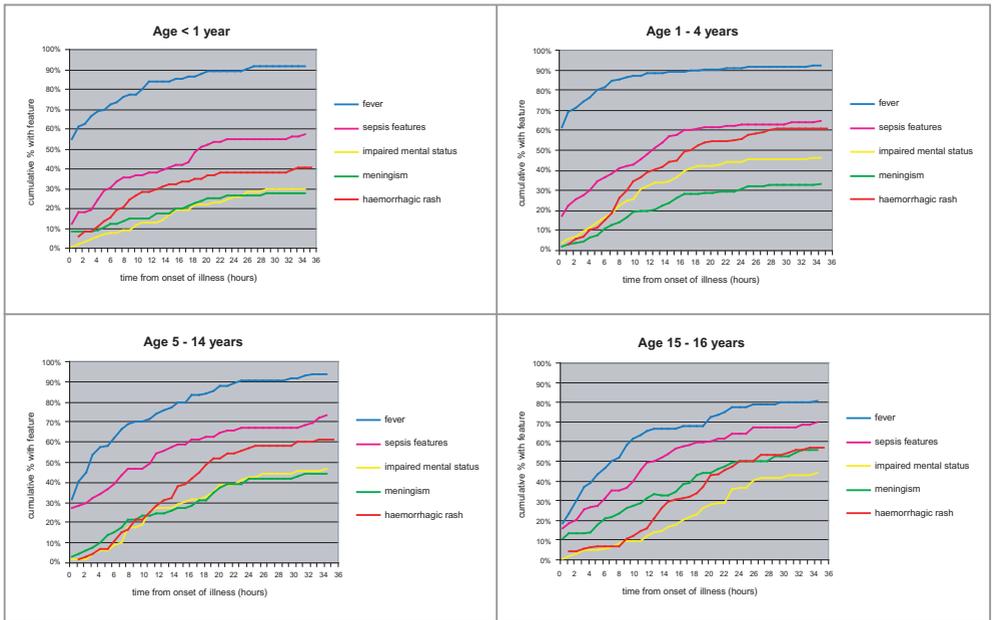
BABIES MAY ALSO SHOW THE FOLLOWING SYMPTOMS:

- 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 national MRF-funded 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, cold hands and feet, or pale or mottled skin** 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. A subsequent MRF-funded study¹¹ found limb pain to be highly specific and cold hands / feet moderately specific to meningococcal disease. Pallor was frequently found in children with minor infections, and was not a discriminating symptom for meningococcal disease.

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. Neck stiffness and photophobia 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 disease¹², it is very important to look for the rash, and a non-blanching rash should therefore be treated as an emergency^{2,8}.

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 specialist².

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 worthwhile¹³.

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

The NICE Guideline on Bacterial Meningitis and Meningococcal Septicaemia¹ identified recognising shock as one of the key priorities for implementation. Early signs of circulatory shutdown and shock 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 Children² specifies that temperature, heart rate, respiratory rate and capillary refill time should be routinely measured and recorded in all feverish children aged under five. Raised heart rate and respiratory rate can both be classified as amber in the NICE traffic light system, specifically:

- Raised heart rate in children under five
- Raised respiratory rate of more than 50 breaths per minute in 6-12 month olds or more than 40 breaths per minute in those aged over 12 months

These children should be assessed face-to-face and their need for paediatric care considered.

Normal Values of Vital Signs			
From Advanced Paediatric Life Support Manual			
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

The NICE guideline on sepsis⁷ encourages clinicians to ask themselves "could this be sepsis" in people of any age presenting with a possible infection.

In those where sepsis is suspected, the recommendations are to assess temperature, heart rate, respiratory rate, blood pressure, level of consciousness and oxygen saturation. Capillary refill time should also be measured in children under 12 years of age if sepsis is suspected.

NICE have produced algorithms and risk stratification tools to help identify cases of sepsis according to age group. These are available from <https://www.nice.org.uk/guidance/ng51/resources>

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. Consider meningococcal septicaemia and shock if capillary refill time > 2 seconds¹, especially if heart and respiratory rate are raised.

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 does not rule out meningitis or septicaemia.

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. **Fever is often absent in babies less than three months of age**
- 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 999 ambulance, and parenteral antibiotics should be given at the earliest opportunity^{1,2,8,16}. Urgent transfer to hospital is the key priority.

For suspected meningococcal disease the NICE meningitis and meningococcal septicaemia guideline¹ advises parenteral antibiotics as soon as possible, either in primary or secondary care. The SIGN guideline⁸, the NICE fever guideline², and the earlier CMO recommendation¹⁶ advise parenteral antibiotics at the pre-hospital stage, but in all cases the goal is to avoid delays.

For suspected meningitis without a rash, NICE recommends urgent transfer without giving antibiotics¹, mainly to enable administration of dexamethasone within 4 hours of the first dose of antibiotics and because the disease progresses more slowly than septicaemia. If urgent transfer to hospital is not possible (for example, in remote locations or adverse weather conditions) then antibiotics should be administered in primary care.

The evidence on effectiveness of pre-hospital antibiotics is inconclusive, since disease severity is a confounding factor^{17,18} so these are consensus based recommendations.

Antibiotics can be administered IV or IM. 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: benzylpenicillin is recommended for pre-hospital administration^{1,2,16} but cefotaxime can also be given⁸.

Benzylpenicillin dosage (BNF)¹⁸

(except in penicillin anaphylaxis)

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 non-blanching rash¹⁹, and the Joint Royal Colleges Ambulance Liaison Committee²¹ 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 Contacts^{22,23}

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 ciprofloxacin, the drug of choice, or alternatively rifampicin or ceftriaxone along with vaccinations if required. This is restricted to those contacts identified by public health following specific guidance^{22,23}. Although cases of meningococcal disease cause widespread alarm, the chance of a second case occurring in the same surroundings is small: 97% of cases have no links to other cases⁶. 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

Patients who survive meningococcal disease require hospital follow-up^{1,8}. Immediate follow-up should have been arranged at the hospital by the discharging clinician, but GPs can refer back to the hospital if a patient has not been followed up appropriately.

Children and young people and their parents should be offered:

- A formal audiological assessment, ideally before hospital discharge and within 4 weeks of being fit to test. Children with severe to profound deafness need an urgent assessment for cochlear implants as soon as they are fit to undergo testing
- A review with the paediatrician 4-6 weeks after discharge
- Information about potential long-term effects and likely patterns of recovery
- Contact details of patient support organisations including meningitis charities such as MRF

The meningitis charities have produced detailed information for parents 'Your Guide' which describes possible after effects, expected recovery patterns and how to access further care and support. Check whether families have been given a copy. We can provide your GP surgery with copies of Your Guide free of charge (back page details how to get copies). Encourage parents to contact us for a free journal in which they can keep a detailed record about their child's illness, recovery and follow up care.

GPs, health visitors and school nurses should have been informed of the child's illness by the hospital that treated the child because although most people recover well, there is a wide range of possible long term sequelae to be aware of:

- 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

GPs should be particularly alert to possible late-onset sensory, neurological, orthopaedic and psychosocial effects. In some cases, sequelae do not become evident until years after the illness, long after routine follow up has ceased^{1,8}.

- 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 apparent²⁴

Psychological follow up is important as children may have difficulty readjusting after discharge, particularly those treated on PICU²⁴. Early referral to Child and Adolescent Mental Health Services may be necessary. Parents as well as children may be prone to post-traumatic stress disorder²⁵. In such cases, children and young people may need referral from their GP for follow up care. Meningitis Research Foundation offers in-depth information, befriending and support to families and individuals affected, see back page for details.

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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.

How Meningitis Research Foundation can help

We are a national registered charity that funds research to prevent meningitis and septicaemia, and to improve survival rates and outcomes. We promote education and awareness, and support 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 which are available to download online. 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

We also produce

- **Symptoms** information: **Baby Watch, Tot Watch, 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.

Freephone helpline 080 8800 3344
www.meningitis.org



Helpline staff respond to requests from people who want help and information, or a listening ear. We offer support, including home visits and a one-to-one befriending service to patients and their families whether 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:

- **Your Guide - recovering from childhood bacterial meningitis and septicaemia:** An information booklet for families with children who are recovering from bacterial meningitis or septicaemia. Your guide is accompanied by a Journal, which provides a place for families to record details about their child's illness, recovery and subsequent follow up care.
- **Support for you:** a leaflet detailing how we can help patients after experiencing meningitis or septicaemia.

All the charity's materials can be ordered free of charge by calling any of our offices (below) or via our website:

www.meningitis.org

If this literature has helped you, please consider helping us. We rely entirely on donations to continue our work, so if you would like to find out about fundraising for us, or to make a donation, please contact your local office below.

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