



Meningococcal Meningitis and Sepsis

Guidance Notes

Diagnosis and Treatment in General Practice

Updated in line with HPSC Guidelines for the early clinical and public health management of bacterial meningitis (including meningococcal disease)



Endorsed by the ICGP

2018 edition Ireland

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

The disease is uncommon, but remains a leading infectious cause of childhood death in Ireland¹ despite the success of meningococcal vaccines. Around 1 in 10 survivors will have a major disability including amputations, brain damage and hearing loss, and over 1 in 3 survivors have one or more problems with physical, cognitive, and psychological functioning². It is more prevalent in winter and may follow outbreaks of influenza³. The risk is highest in children under five and adolescents and is increased by contact with a case⁴.

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 sepsis* it may be impossible to distinguish them from someone with a milder self-limiting illness⁵. For this reason it is important to provide a 'safety net' when a patient with a non-specific febrile illness is seen in primary care⁶.

Safety net: If a GP decides that a patient with a non-specific febrile illness does not need to go to hospital, the GP should advise the parent/carer to check the patient often, looking out for deterioration or development of a rash.⁶

- Encourage 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,^{1,5} and advise on accessing further healthcare
- Provide information about symptoms of serious illness, including how to identify a non-blanching rash¹, and the Tumbler Test (see back page to order free patient information).

It may also be necessary to:

- Review the situation within 4–6 hours if early meningococcal disease cannot be ruled out at the first assessment^{5,7}
- 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 situation⁸ as well as proximity to the surgery and to out of hours and emergency care, and any individual problems with access or transport.



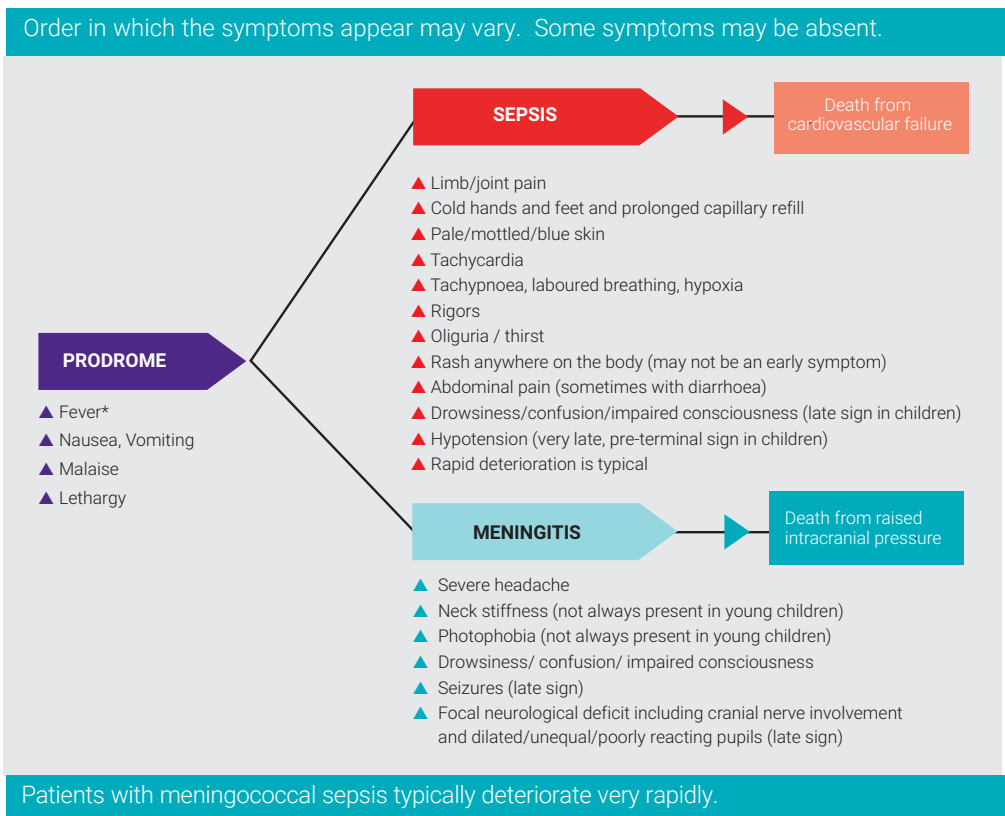
Press the tumbler firmly against the skin to test the rash

Disease Pathway

Meningococcal disease has two main clinical presentations: meningitis and sepsis, which often occur together. Sepsis is more common and more dangerous. It is most likely to be fatal when it occurs without meningitis⁹.

A patient with sepsis 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 sepsis 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.



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

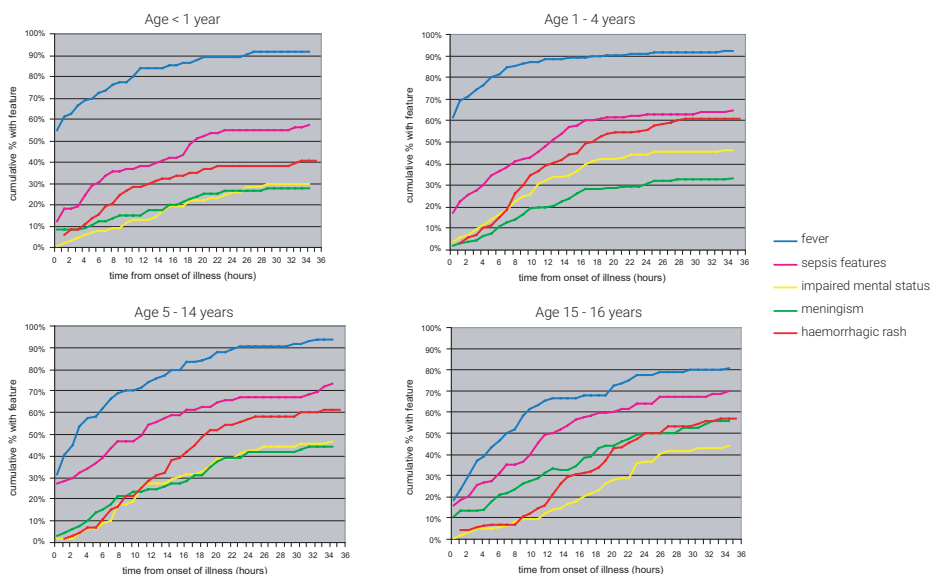
BABIES MAY ALSO SHOW THE FOLLOWING SYMPTOMS:

- 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 study⁵ 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 sepsis 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 sepsis, see figure below.



Reproduced from Thompson M and Ninis N¹²

Red Flag Symptoms – Early Sepsis

In all age groups, signs of sepsis 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 study¹⁰ 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 sepsis 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 sepsis 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 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 emergency¹.

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, blanching 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

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 GP⁵. The underlying meningitis or sepsis 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 sepsis and signs of meningitis.

2. EARLY SIGNS OF SEPSIS AND ADVANCING SHOCK

The UK NICE Meningitis (bacterial) and meningococcal septicaemia guideline¹ identifies 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**.

Be aware that children and young people with meningitis commonly present with non-specific symptoms and signs, including fever, vomiting, irritability, and upper respiratory tract symptoms¹. In patients with meningitis, vital signs may remain normal until late in the illness (see sections 3,4 and 5).

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 sepsis and shock if capillary refill time >2 seconds^{1,6}, especially if heart and respiratory rate are raised.

Normal Values of Vital Signs

Adapted from Advanced Paediatric Life Support Manual¹³

Age	RR/min	HR/min	Systolic BP
Birth	25-50	120-170	80-90
3 m	25-45	115-160	80-90
6 m	20-40	110-160	80-90
12 m	20-40	110-160	85-95
18 m	20-35	100-155	85-95
2 y	20-30	100-150	85-100
3 y	20-30	90-140	85-100
4 y	20-30	80-135	85-100
5 y	20-30	80-135	90-110
6 y	20-30	80-130	90-110
8 y	15-25	70-120	90-110
12 y	12-24	65-115	100-120
>14 y	12-24	60-110	100-120

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 sepsis is far advanced.

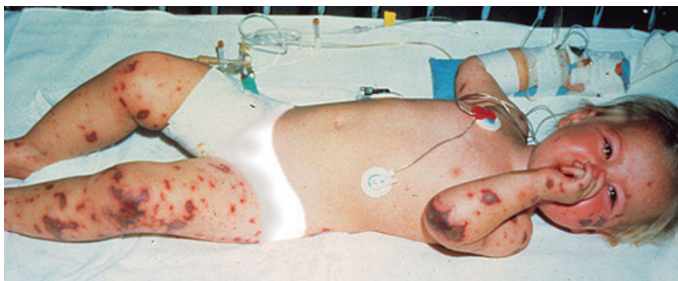
In conjunction with other signs, postural hypotension in adults may suggest shock.

3. CONSCIOUS LEVEL

This can be assessed by checking **AVPU**:

Alert? **R**esponds to **V**oice? **R**esponds to **P**ain? **U**nresponsive?

Drowsiness/impaired consciousness in children with sepsis 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 sepsis. 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 sepsis.

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 sepsis^{5,15} - 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 sepsis

Pre-hospital treatment and further action

Transfer to Hospital⁶

If meningococcal infection is suspected, the patient should be transferred to hospital by quickest means of transport, usually emergency ambulance. Urgent transfer to hospital is the key priority - do not delay urgent transfer to hospital to give parenteral antibiotics.

The ambulance service needs to be informed of the immediate and critical nature of the transfer. GPs should telephone and inform the emergency department and clinician at the referral hospital of the patient's impending arrival so that delays in treatment are minimal. The hospital clinician needs to know whether there is a rash, whether there are serious prognostic signs such as a rapidly evolving rash, shock, or impaired conscious level as well as antibiotics that have been administered (and dose).

It is strongly recommended that any patient with an acute systemic febrile illness is referred immediately to hospital if any of the following are present:

- A haemorrhagic rash
- An impaired level of consciousness
- Signs of meningeal infection
- Clinical features not normally expected in children with acute self limiting systemic febrile illnesses
- The patient is a close contact of someone who was recently diagnosed as having meningococcal disease even if the current patient received clearance antibiotics.

Antibiotic Therapy

If meningococcal infection is suspected, administration of benzylpenicillin by the GP or advanced paramedic may be life saving and is strongly recommended⁶.

All GPs or advanced paramedics should have benzylpenicillin available in their surgeries and emergency bags and should be ready to administer it without delay to a patient with an acute systemic febrile illness and a petechial or purpuric rash. It is particularly important that this should be done if a person shows signs of sepsis or decreased level of consciousness⁶.

Choice of antibiotic: benzylpenicillin is recommended for pre-hospital administration, but if available cefotaxime 50 mg/kg (up to 2g) (all ages) or ceftriaxone 80 mg/kg (up to 2g) (all ages) can also be given.

Benzylpenicillin dosage⁶ (except if proven history of penicillin anaphylaxis)

Adult and child aged 10 or older: 1200 mg

Child 1-9 years: 600 mg

Infant: 300 mg

Route: IV if possible, otherwise IM into part of a limb that is perfused and warm.

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.

Case Notification

Under the statutory Infectious Disease Regulations 1981, amended 2003¹⁶, cases or suspect cases of bacterial meningitis/meningococcal sepsis must be notified immediately to the Department of Public Health (Medical Officer of Health). This is the responsibility of the admitting team but GPs may wish to check that this has been done.

Dealing with Patient Contacts¹⁷

The local Department of Public Health is responsible for ensuring that intimate and household contacts of a patient with meningococcal disease who require antibiotic prophylaxis are prescribed either rifampicin, ciprofloxacin or ceftriaxone, along with vaccinations if required. 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). Vigilance for signs and symptoms among contacts is important especially in the week after the case occurred.

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.

Children and young people and their parents should be offered:

- Information about and access to further care after discharge
- Contact details of patient support organisations such as MRF that can offer support, befriending, in-depth information, advocacy, counselling, and written information to signpost families to further help¹

After bacterial meningitis and meningococcal sepsis, children/young people should be offered a formal audiological assessment as soon as possible, preferably before discharge, but within 4 weeks of being fit to test¹. Children/young people with severe or profound deafness should be offered an urgent assessment for cochlear implants as soon as they are fit to undergo testing¹⁸. Hearing tests may need to be repeated and may require referral from general practice.

Psychological follow up is important as there may be difficulty readjusting after discharge, particularly those treated on ICU / PICU¹⁹. Early referral to Mental Health Services may be necessary. Parents as well as children may be prone to post-traumatic stress disorder¹⁹.

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 apparent²⁰

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

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 Ireland, the US and the UK.

This resource no longer makes reference to the SIGN 102 guideline Management of invasive meningococcal disease in children & young people as it has been archived and the evidence-base included in NICE CG102.

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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 which are available to download online.

Please visit www.meningitis/shop/resources

We can help by providing the following:

- **Your Guide** provides in-depth information for parents about recovery and potential after effects of meningitis and septicaemia.
- **My Journal** is a place for parents and children to keep a personal record of the illness and their recovery, available online.
- **Meningitis Baby Watch** for signs and symptoms of meningitis and septicaemia in babies, available as both a poster and a card.
- **Symptoms awareness** resources list the signs and symptoms of meningitis and septicaemia, also available as both a poster and a card.
- **Am I at risk?** leaflet answers questions for those who have been in contact with a case and gives more information on symptoms, vaccines and treatment.
- **Vaccine factsheets** for more in-depth information on meningococcal and pneumococcal vaccines.

Free helpline 1800 41 33 44

Helpline staff respond to calls from people who want help and information. Through the Helpline, the charity offers support and a one-to-one befriending service to patients and their families whether they are currently ill, recovering, managing after effects, or bereaved.

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

This resource is funded by donations. If you have found it useful and are able to support our work, you can contact us on the number below or donate on our website.

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