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 guideline

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If you wish to comment on this version of the guideline, please be aware that all the supporting information and evidence is contained in the full version.

Contents

Introduction

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. In children and young people aged 3 months or older the most frequent causes of bacterial meningitis include *Neisseria meningitidis* (meningococcus), *Streptococcus pneumoniae* (pneumococcus) and *Haemophilus influenzae* type b (Hib). These organisms occur normally in the upper respiratory tract and can cause invasive disease when acquired by a susceptible person. In neonates (children younger than 28 days) the most common causative organisms are *Streptococcus agalactiae* (Group B streptococcus), *Escherichia coli*, *S pneumoniae* and *Listeria monocytogenes*.

Most *N meningitidis* infections are asymptomatic, but occasionally the organism invades the bloodstream to cause disease. Meningococcal disease most commonly presents as bacterial meningitis (15% of cases) or septicaemia (25% of cases), or as a combination of the two syndromes (60% of cases). Meningococcal disease is the leading infectious cause of death in early childhood, making its control a priority for clinical management (as well as public health surveillance and control).

The epidemiology of bacterial meningitis in the UK has changed dramatically in the past two decades following the introduction of vaccines to control Hib, serogroup C meningococcus and pneumococcal disease. As no vaccine is currently licensed against serogroup B meningococcus this pathogen is now the most common cause of meningitis (and septicaemia) in children and young people aged 3 months or older.

This guideline does not consider meningitis associated with tuberculosis (TB), because tubercular meningitis (or meningeal TB) is covered in ‘Tuberculosis: clinical diagnosis and management of tuberculosis, and measures for its prevention and control’ (NICE clinical guideline 33). However, some features

of the presentation of tubercular meningitis are indistinguishable from bacterial meningitis.

Under the Public Health (Infectious Diseases) Regulations 1988, registered medical practitioners in England and Wales have a legal requirement to notify a 'proper officer' of the local authority (usually the Consultant in Communicable Disease Control) of suspected cases of meningitis and meningococcal septicaemia.

Where the evidence supported it, the Guideline Development Group made separate recommendations for the management of different conditions (bacterial meningitis, meningococcal septicaemia and, in some cases, meningococcal disease). Unless otherwise specified the recommendations refer to all children and young people aged under 16 years. The Guideline Development Group also used the term neonate in some recommendations.

Unless otherwise stated, the drug dosages given in the recommendations are consistent with the summary of product characteristics (SPC). The guideline will assume that prescribers will use a drug's summary of product characteristics (SPC) to inform their decisions for individual patients.

Patient-centred care

This guideline offers best practice advice on the care of children and young people younger than 16 years with bacterial meningitis and meningococcal septicaemia.

Treatment and care should take into account the child's or young person's needs and preferences, as well as those of their parents or carers. Children and young people with bacterial meningitis and meningococcal septicaemia should have the opportunity to make informed decisions about their care and treatment, in partnership with their healthcare professionals, but this depends on their age and capacity to make decisions. Where a child or young person is not old enough or does not have the capacity to make decisions, healthcare professionals should follow the Department of Health's advice on consent (available from www.dh.gov.uk/consent) and the code of practice that accompanies the Mental Capacity Act (summary available from www.publicguardian.gov.uk).

If the patient is under 16, healthcare professionals should follow the guidelines in 'Seeking consent: working with children' (available from www.dh.gov.uk).

Good communication between healthcare professionals and children and young people, and their parents and carers, is essential. It should be supported by evidence-based written information tailored to their specific needs. Treatment and care, and information given about it, should be culturally appropriate. Information should also be accessible to people with additional needs such as physical, sensory or learning disabilities, and to people who do not speak or read English.

Care of young people in transition between paediatric and adult services should be planned and managed according to the best practice guidance described in 'Transition: getting it right for young people' (available from www.dh.gov.uk).

Adult and paediatric healthcare teams should work jointly to provide assessment and services to young people with bacterial meningitis and meningococcal septicaemia. Diagnosis and management should be reviewed throughout the transition process, and there should be clarity about who is the lead clinician to ensure continuity of care.

Key priorities for implementation

Symptoms and signs of bacterial meningitis and meningococcal septicaemia

Use tables 1 and 2 to identify children and young people who may have bacterial meningitis or meningococcal septicaemia[1]. Non-specific signs, such as fever and vomiting, are common in both conditions. **[1.1.1.1]**

Table 1 Symptoms and signs of bacterial meningitis

	Symptom/sign	Children under 2 years (including neonates)	Children and young people 2 years or older
Early	Cold hands and feet	NK	NK
	Fever	+++	+++
	Irritability	+++	++
	Leg pain	NK	NK
	Lethargy	++	NK
	Respiratory symptoms	++	++
	Vomiting	++	+++
Late	Bulging fontanelle	++	Not relevant at this age
	Clinical shock	+	+
	Confusion	Not relevant at this age	NK
	Convulsions/seizures	++	+
	Focal neurological signs	NK	+
	Impaired consciousness	+	+++
	Neck stiffness	++	+++
	Petechial rash	NK (more common in meningococcal meningitis)	++ (more common in meningococcal meningitis)
	Purpuric rash	NK (more common in meningococcal meningitis)	NK (more common in meningococcal meningitis)
	Photophobia	+	+
	Rapid deterioration in condition	NK	NK
+ prevalence less than 25% ++ prevalence 25−50% +++ prevalence more than 50% NK prevalence not known			

[1] The prevalence figures are derived from studies reviewed for the guideline. See sections 3.1 and 3.2 of the full guideline for details.

Table 2 Symptoms and signs of meningococcal septicaemia

	Symptom/sign	Children under 2 years (including neonates)	Children and young people 2 years or older
Early	Cold hands and feet	+++	++
	Fever	+++	+++
	Irritability	+	++
	Leg pain	+	++
	Lethargy	+	+++
	Respiratory symptoms	+	+
	Vomiting	++	+++
Late	Bulging fontanelle	+	Not relevant at this age
	Clinical shock	++	++
	Confusion	Not relevant at this age	++
	Convulsions/seizures	+	+
	Focal neurological signs	NK	NK
	Impaired consciousness	++	+++
	Neck stiffness	+	++
	Petechial rash	++	++
	Purpuric rash	+	+
	Photophobia	+	+
	Rapid deterioration in condition	+++	+++

+ prevalence less than 25%
++ prevalence 25−50%
+++ prevalence more than 50%
NK prevalence not known

Management in the pre-hospital setting

- Transfer children and young people with suspected bacterial meningitis or suspected meningococcal septicaemia to secondary care as an emergency by telephoning 999. **[1.2.1.1]**

Diagnosis in secondary care

Non-specific tests for meningococcal disease

- Do a full blood count, C-reactive protein (CRP), coagulation, blood culture, polymerase chain reaction (PCR), blood gas and glucose for children and young people with an unexplained petechial rash and fever (or history of fever) and any of the following:

- spreading rash
- purpura
- signs of bacterial meningitis (see table 1)
- signs of meningococcal septicaemia (see table 2)
- looking unwell.

These children and young people should be considered to be at high risk of having meningococcal disease and intravenous ceftriaxone (80 mg/kg once daily) should be started immediately. **[1.3.1.3]**

Polymerase chain reaction

- In children and young people with suspected bacterial meningitis (including meningococcal meningitis) submit blood and CSF samples for PCR testing to confirm the diagnosis. **[1.3.3.2]**

Contraindications to lumbar puncture

- In children and young people aged 28 days or older with suspected bacterial meningitis, perform a lumbar puncture unless any of the following contraindications are present:

    - signs suggesting raised intracranial pressure
        - reduced level of consciousness (Glasgow Coma Score less than 9)
        - relative bradycardia and hypertension
        - focal neurological signs
        - abnormal posture
        - unequal, dilated or poorly responsive pupils
        - papilloedema
        - abnormal ‘doll’s eye’ movements
    - uncorrected shock (tachycardia and poor peripheral perfusion and/or hypotension)
    - extensive or extending purpura
    - after convulsions

  - within 30 minutes of a convulsive seizure lasting 30 minutes or less
  - following a prolonged convulsive seizure (lasting more than 30 minutes)
  - following a tonic seizure
- coagulation abnormalities
  - clotting study results (if obtained) outside the normal range
  - platelet count below 100 x 10^9/litre
  - receiving anticoagulant therapy
- local superficial infection at potential lumbar puncture site
- respiratory insufficiency (for children and young people in whom lumbar puncture has a high likelihood of resulting in respiratory failure). **[1.3.6.1]**

Management in secondary care

Fluids for bacterial meningitis

- Do not restrict fluids in children and young people with suspected or confirmed bacterial meningitis unless there are signs of raised intracranial pressure or evidence of increased antidiuretic hormone secretion. **[1.4.2.3]**

Intravenous fluid resuscitation

- In children and young people with suspected meningococcal septicaemia:

  - if there are signs of shock give an immediate fluid bolus of 20ml/kg sodium chloride 0.9% over 5-10 minutes. Give the fluid intravenously or via an intraosseous route and reassess the child or young person immediately afterwards
  - if despite the initial 20ml/kg sodium chloride 0.9% bolus the signs of shock persist, immediately give a second bolus of 20ml/kg of intravenous or intraosseous sodium chloride 0.9% or human albumin 4.5% solution over 5–10 minutes
  - if following two bolus infusions (total 40ml/kg) the signs of shock persist:

  - immediately give a third bolus 20ml/kg of intravenous or intraosseous sodium chloride 0.9% or human albumin 4.5% solution over 5–10 minutes
  - call for on-site anaesthetic assistance for urgent tracheal intubation and mechanical ventilation
  - start treatment with vasoactive drugs
  - be aware that some children and young people may require large volumes of fluid over a short period of time to restore their circulating volume and consider giving further fluid boluses at 20ml/kg of intravenous or intraosseous sodium chloride 0.9% or human albumin 4.5% solution over 5–10 minutes based on clinical signs and appropriate laboratory investigations
- discuss further management with a paediatric intensivist. **[1.4.2.10]**

Retrieval and transfer to tertiary care

- Healthcare professionals involved in the treatment of seriously ill children and young people should be trained in the recognition and management of meningococcal disease. **[1.4.7.3]**

Long-term management

- Children and young people who have had bacterial meningitis or meningococcal septicaemia should be reviewed by a paediatrician with the results of their hearing test 4–6 weeks after discharge from hospital to discuss morbidities associated with their condition and offered referral to the appropriate services. The following morbidities should be specifically considered:

  - hearing loss
  - orthopaedic complications (damage to bones and joints)
  - skin complications (including scarring from necrosis)
  - psychosocial problems
  - neurological and developmental problems
  - renal failure. **[1.5.1.5]**

1 Guidance

The following guidance is based on the best available evidence. The full guideline ([add hyperlink]) gives details of the methods and the evidence used to develop the guidance.

1.1 Symptoms and signs of bacterial meningitis and meningococcal septicaemia

1.1.1.1 Use tables 1 and 2 to identify children and young people who may have bacterial meningitis or meningococcal septicaemia. Non-specific signs, such as fever and vomiting, are common in both conditions[2].

Table 1 Symptoms and signs of bacterial meningitis

	Symptom/sign	Children under 2 years (including neonates)	Children and young people 2 years or older
Early	Cold hands and feet	NK	NK
	Fever	+++	+++
	Irritability	+++	++
	Leg pain	NK	NK
	Lethargy	++	NK
	Respiratory symptoms	++	++
	Vomiting	++	+++
Late	Bulging fontanelle	++	Not relevant at this age
	Clinical shock	+	+
	Confusion	Not relevant at this age	NK
	Convulsions/seizures	++	+
	Focal neurological signs	NK	+
	Impaired consciousness	+	+++
	Neck stiffness	++	+++
	Petechial rash	NK (more common in meningococcal meningitis)	++ (more common in meningococcal meningitis)
	Purpuric rash	NK (more common in meningococcal meningitis)	NK (more common in meningococcal meningitis)
	Photophobia	+	+
	Rapid deterioration in condition	NK	NK
+ prevalence less than 25% ++ prevalence 25−50%			

[2] The prevalence figures are derived from studies reviewed for the guideline. See sections 3.1 and 3.2 of the full guideline for details.

+++ prevalence more than 50%
NK prevalence not known

Table 2 Symptoms and signs of meningococcal septicaemia

	Symptom/sign	Children under 2 years (including neonates)	Children and young people 2 years or older
Early	Cold hands and feet	+++	++
	Fever	+++	+++
	Irritability	+	++
	Leg pain	+	++
	Lethargy	+	+++
	Respiratory symptoms	+	+
	Vomiting	++	+++
Late	Bulging fontanelle	+	Not relevant at this age
	Clinical shock	++	++
	Confusion	Not relevant at this age	++
	Convulsions/seizures	+	+
	Focal neurological signs	NK	NK
	Impaired consciousness	++	+++
	Neck stiffness	+	++
	Petechial rash	++	++
	Purpuric rash	+	+
	Photophobia	+	+
	Rapid deterioration in condition	+++	+++

+ prevalence less than 25%
++ prevalence 25−50%
+++ prevalence more than 50%
NK prevalence not known

1.1.1.2 Be aware that classical signs of meningitis (neck stiffness, bulging fontanelle, high-pitched cry) are often absent in infants with bacterial meningitis (This recommendation is from ‘Feverish illness in children’ [NICE clinical guideline 47]).

1.1.1.3 Be aware that children and young people with bacterial meningitis commonly present with non-specific signs including fever, vomiting, respiratory symptoms and irritability. Some children with bacterial meningitis will present with seizures (see table 2 in ‘Feverish illness in children’ [NICE clinical guideline 47]).

1.1.1.4 Healthcare professionals should consider other non-specific features of the child's or young person's presentation, such as the level of parental concern (particularly compared with previous illness in the child or young person or their family), how quickly the illness is progressing, and clinical judgement of the overall severity of the child's or young person's illness.

1.1.1.5 Remain alert to the possibility of meningococcal disease when assessing children or young people with acute febrile illness.

1.1.1.6 In children and young people with suspected bacterial meningitis undertake and record physiological observations of heart rate, respiratory rate, SpO2, blood pressure, temperature and neurological assessment (for example the Alert, Voice, Pain, Unresponsive [AVPU] scale) at least hourly.

1.2 Management in the prehospital setting

1.2.1.1 Transfer children and young people with suspected bacterial meningitis or suspected meningococcal septicaemia to secondary care as an emergency by telephoning 999.

1.2.1.2 In children and young people with suspected bacterial meningitis or suspected meningococcal septicaemia, give parenteral antibiotics at the earliest opportunity, either in primary or secondary care.

1.2.1.3 In children and young people with suspected bacterial meningitis or suspected meningococcal septicaemia, do not give parenteral antibiotics if this will delay urgent transfer to hospital.

1.2.1.4 In children and young people with suspected bacterial meningitis or suspected meningococcal septicaemia, if antibiotics are administered before admission to hospital, give intramuscular benzylpenicillin (children under 1 year 300 mg, children 1–9 years 600 mg, children and young people 10 years and over 1.2 g).

1.2.1.5 Do not give benzylpenicillin or any other antibiotic before admission to hospital to children and young people with suspected bacterial meningitis or suspected meningococcal septicaemia who have a history of severe allergy to penicillins or cephalosporins (such as collapse, loss of consciousness, difficulty in breathing or rash).

1.2.1.6 In children and young people with suspected bacterial meningitis or suspected meningococcal septicaemia who have a history of intolerance to penicillins or cephalosporins (such as diarrhoea or vomiting) give parenteral benzylpenicillin.

1.3 Diagnosis in secondary care

1.3.1 Non-specific tests for meningococcal disease

1.3.1.1 Perform a very careful examination for signs of underlying meningitis or septicaemia in children and young people presenting with petechial rashes (see tables 1 and 2).

1.3.1.2 Give intravenous ceftriaxone (80 mg/kg once daily) (see recommendation 1.4.1.1) immediately if any of the following occur at any point during the assessment of a child or young person:

- a rash becomes purpuric
- petechiae start to spread
- the child or young person looks unwell
- signs of meningitis or septicaemia are found (see tables 1 and 2).

1.3.1.3 Do a full blood count, C-reactive protein (CRP), coagulation, blood culture, polymerase chain reaction (PCR), blood gas and glucose for children and young people with an unexplained petechial rash and fever (or history of fever) and any of the following:

- spreading rash
- purpura
- signs of bacterial meningitis (see table 1)

- signs of meningococcal septicaemia (see table 2)
- looking unwell.

These children and young people should be considered to be at high risk of having meningococcal disease and intravenous ceftriaxone (80 mg/kg once daily) should be started immediately (see recommendation 1.4.1.1).

1.3.1.4 Do a full blood count and CRP (with coagulation, blood culture, PCR, and blood gas if the blood sample is sufficient) on presentation for children and young people with a non-spreading petechial rash and fever (or history of fever) who do not have any purpura, signs of meningitis or septicaemia (see tables 1 and 2) and who do not look unwell.

- Children and young people with a raised CRP and/or raised white blood cell count (especially if the neutrophil count is raised) should be considered to be at increased risk of having meningococcal disease and treated with intravenous ceftriaxone (80 mg/kg once daily) immediately (see recommendation 1.4.1.1).
- Children and young people with a normal CRP and normal white blood cell count are less likely to have meningococcal disease.
  - Assess clinical progress (vital signs [respiratory rate, heart rate, blood pressure, capillary refill time, conscious level, temperature and saturations] and carry out observations [at least hourly]) over the next 4–6 hours to determine the likelihood of the child or young person having meningococcal disease.
  - If doubt remains, treat with antibiotics and admit to hospital.
- 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 looks unwell.

1.3.1.5 Consider full blood count and clotting studies for children and young people presenting with a non-spreading petechial rash, which may be present for more than 24 hours, without a fever (or any history of fever) and who do not look unwell. These children and young people are unlikely to have meningococcal disease and other differential diagnoses should be considered.

1.3.1.6 In children and young people with suspected meningococcal septicaemia, anticipate, monitor and correct the following metabolic disturbances using local or national protocols:

- hypoglycaemia
- acidosis
- hypokalaemia
- hypocalcaemia
- hypomagnesaemia
- anaemia
  coagulopathy.

1.3.2 Non-specific tests for bacterial meningitis

1.3.2.1 In children and young people with suspected bacterial meningitis do a CRP and white blood cell count.

1.3.2.2 Do not use a normal CRP and white blood cell count to rule out bacterial meningitis.

1.3.2.3 If there is a raised CRP or white blood cell count in the presence of a non-specifically abnormal (that is, possibly viral) cerebrospinal fluid (CSF) treat as suspected bacterial meningitis.

1.3.2.4 If no CSF is available or if CSF findings are uninterpretable, manage suspected bacterial meningitis in children and young people as if the diagnosis is confirmed, regardless of the CRP and white blood cell count.

1.3.3 Polymerase chain reaction

1.3.3.1 In children and young people with suspected meningococcal disease, submit EDTA (ethylenediaminetetraacetic acid) whole blood routinely for real-time PCR testing to confirm the diagnosis. If lumbar puncture is performed, submit CSF for PCR analysis. The blood sample should be taken as soon as possible after admission (up to 72 hours).

1.3.3.2 In children and young people with suspected bacterial meningitis (including meningococcal meningitis) submit blood and CSF samples for PCR testing to confirm the diagnosis.

1.3.4 Skin lesions and throat swabs for meningococcal disease

1.3.4.1 Do not use skin biopsies, aspirates (samples aspirated with a needle and syringe from a petechial/purpuric skin lesion), scrapings or throat swabs for the diagnosis of meningococcal disease in children and young people.

1.3.5 Lumbar puncture and cerebrospinal fluid parameters

1.3.5.1 Perform a lumbar puncture as a primary investigation in children and young people with suspected bacterial meningitis unless this is contraindicated (see recommendations 1.3.6.1 and 1.3.8.1).

1.3.5.2 Do not allow lumbar puncture to delay the administration of parenteral antibiotics.

1.3.5.3 Lumbar puncture results (white blood cell count, protein and glucose) should be made available within 4 hours to support clinical decision making with regard to adjunctive steroid therapy (see recommendation 1.4.3.2).

1.3.5.4 In children and young people with suspected bacterial meningitis, send a CSF sample for examination for white blood cells, total protein and glucose concentrations, and a Gram stain, and a

corresponding blood sample for a laboratory-determined glucose concentration.

1.3.5.5 In children and young people with suspected bacterial meningitis, the results of CSF microscopy and biochemical analyses should be made available within 4 hours of the CSF sample being taken to support clinical decision making with regard to adjunctive steroid therapy (see recommendation 1.4.3.2).

1.3.5.6 In children and young people aged 28 days or older, start antibiotic treatment for bacterial meningitis if the CSF white blood cell count is abnormal (more than 5 cells/microlitre or more than one neutrophil is present), regardless of other CSF variables.

1.3.5.7 In neonates, start antibiotic treatment for bacterial meningitis if the CSF white blood cell count is abnormal (20 cells/microlitre or more). If the CSF white blood cell count is less than 20 cells/microlitre, bacterial meningitis should still be considered if other symptoms and signs are present (see table 1).

1.3.5.8 In children and young people with suspected bacterial meningitis, consider alternative diagnoses if the child or young person is significantly unwell and has CSF variables within the accepted normal ranges.

1.3.5.9 If pleocytosis is present and there is a history suggesting a risk of tuberculosis, evaluate for the diagnosis of tuberculosis in line with 'Tuberculosis' (NICE clinical guideline 33).

1.3.6 Contraindications to lumbar puncture

1.3.6.1 In children and young people aged 28 days or older with suspected bacterial meningitis, perform a lumbar puncture unless any of the following contraindications are present:

- signs suggesting raised intracranial pressure

  - reduced level of consciousness (Glasgow Coma Score less than 9)
  - relative bradycardia and hypertension
  - focal neurological signs
  - abnormal posture
  - unequal, dilated or poorly responsive pupils
  - papilloedema
  - abnormal 'doll's eye' movements
- uncorrected shock (tachycardia and poor peripheral perfusion and/or hypotension)
- extensive or extending purpura
- after convulsions
  - within 30 minutes of a convulsive seizure lasting 30 minutes or less
  - following a prolonged convulsive seizure (lasting more than 30 minutes)
  - following a tonic seizure
- coagulation abnormalities
  - clotting study results (if obtained) outside the normal range
  - platelet count below 100 x 10^9/litre
  - receiving anticoagulant therapy
- local superficial infection at potential lumbar puncture site
- respiratory insufficiency (for children and young people in whom lumbar puncture has a high likelihood of resulting in respiratory failure).

1.3.6.2 In neonates with suspected bacterial meningitis do not perform a lumbar puncture if any of the following contraindications are present:

- signs suggesting raised intracranial pressure other than a full or bulging fontanelle
  - relative bradycardia and hypertension

  - focal neurological signs
  - abnormal posture
  - unequal, dilated or poorly responsive pupils
  - papilloedema
  - abnormal 'doll's eye' movements
- uncorrected shock (tachycardia and poor peripheral perfusion and/or hypotension)
- extensive or extending purpura
- after convulsions
  - within 30 minutes of a convulsive seizure lasting 30 minutes or less
- coagulation abnormalities
  - clotting study results (if obtained) outside the normal range
  - platelet count below 100 x 10^9/litre
  - receiving anticoagulant therapy
- local superficial infection at potential lumbar puncture site
- respiratory insufficiency (for neonates in whom lumbar puncture has a high likelihood of resulting in respiratory failure).

1.3.6.3 In children and young people with suspected bacterial meningitis, if contraindications to lumbar puncture exist at presentation consider delaying lumbar puncture until there are no longer contraindications (see recommendations 1.3.6.1 and 1.3.6.2). Delayed lumbar puncture is especially worthwhile if there is diagnostic uncertainty or unsatisfactory clinical progress.

1.3.6.4 Perform a lumbar puncture in children and young people with suspected meningococcal septicaemia (see table 2), unless there are signs of shock or other contraindications (see recommendations 1.3.6.1 and 1.3.6.2).

1.3.6.5 Use local or national protocols for management of seizures in children and young people with suspected bacterial meningitis or meningococcal septicaemia.

1.3.7 Repeat lumbar puncture in neonates

1.3.7.1 Do not perform a repeat lumbar puncture in neonates who are receiving the antibiotic treatment appropriate to the causative organism and are making a good clinical recovery.

1.3.7.2 Do not perform a repeat lumbar puncture before stopping antibiotic therapy in neonates who are clinically well.

1.3.7.3 Perform a repeat lumbar puncture in neonates who have persistent or re-emergent fever, deterioration in clinical condition, new clinical findings (especially neurological findings), or persistently abnormal inflammatory markers.

1.3.8 Cranial computed tomography for bacterial meningitis

1.3.8.1 In children and young people with suspected bacterial meningitis use clinical assessment (including clinical evaluation for signs of raised intracranial pressure), not a cranial computed tomography (CT) scan, to decide whether it is safe to perform a lumbar puncture.

1.3.8.2 In children and young people with suspected bacterial meningitis who have a reduced level of consciousness (Glasgow Coma Score less than 9) or focal neurological signs, perform a CT scan to detect other possible intracranial pathologies.

1.3.8.3 Clinically stabilise children and young people with suspected bacterial meningitis before CT scanning (see section 1.4.3).

1.3.8.4 Do not delay treatment to undertake a CT scan in children and young people with suspected bacterial meningitis.

1.3.8.5 In children and young people with suspected bacterial meningitis, if a decision is made to perform a CT scan, ensure it is undertaken in consultation with the anaesthetist, paediatrician or intensivist.

1.3.8.6 Do not perform a lumbar puncture in children and young people with suspected bacterial meningitis if a CT scan shows radiological evidence of raised intracranial pressure.

Use local or national protocols to treat raised intracranial pressure in children and young people with suspected bacterial meningitis.

1.4 Management in secondary care

1.4.1 Antibiotics

1.4.1.1 Where ceftriaxone is the recommended treatment, do not use it at the same time as administering calcium-containing infusions. Instead, use cefotaxime (50 mg/kg three times daily).

1.4.1.2 In children younger than 3 months where cefotaxime (with or without ampicillin or amoxillin) is the recommended treatment, use ceftriaxone (80 mg/kg once daily) as an alternative but avoid using it in children who are jaundiced, hypoalbuminaemic, acidotic or born prematurely as it may exacerbate hyperbilirubinaemia. Do not use ceftriaxone at the same time as administering calcium-containing infusions.

Suspected bacterial meningitis

1.4.1.3 Treat suspected bacterial meningitis in children and young people aged 3 months or older with intravenous ceftriaxone (80 mg/kg once daily) without delay.

1.4.1.4 Treat suspected bacterial meningitis in children younger than 3 months with intravenous cefotaxime (50 mg/kg three times daily) plus amoxicillin (50–100 mg/kg daily) or ampicillin (125 mg four times daily) without delay.

1.4.1.5 Treat suspected bacterial meningitis in children and young people 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 cefotaxime (50 mg/kg three times daily)

or ceftriaxone (80 mg/kg once daily) (plus amoxicillin [50–100 mg/kg daily] or ampicillin [125 mg four times daily] in children younger than 3 months).

1.4.1.6 Treat suspected meningococcal disease in children and young people with intravenous ceftriaxone (80 mg/kg once daily) without delay.

1.4.1.7 If tubercular meningitis is part of the differential diagnosis use antibiotic treatment appropriate for tuberculosis in line with 'Tuberculosis' (NICE clinical guideline 33).

Unconfirmed bacterial meningitis

1.4.1.8 In children and young people aged 3 months or older with unconfirmed, uncomplicated but clinically suspected bacterial meningitis treat with intravenous ceftriaxone (80 mg/kg once daily) for at least 10 days depending on symptoms and signs and course of the illness.

1.4.1.9 In children younger than 3 months with unconfirmed but clinically suspected bacterial meningitis treat with cefotaxime (50 mg/kg three times daily) plus ampicillin (125 mg four times daily) or amoxicillin (50–100 mg/kg daily) for at least 14 days. If the clinical course is complicated[3] consider extending the duration of treatment and consulting an expert in paediatric infectious diseases.

Confirmed bacterial meningitis

1.4.1.10 In children and young people aged 3 months or older with confirmed bacterial meningitis caused by *H influenzae* type b treat with intravenous ceftriaxone (80 mg/kg once daily) for 10 days in total unless directed otherwise by the results of antibiotic sensitivities.

[3] For example, if there is poor response to antibiotic therapy, effusion or abscess, or concomitant intraventricular haemorrhage in a premature baby .

1.4.1.11 In children and young people aged 3 months or older with confirmed bacterial meningitis caused by *S pneumoniae* treat with intravenous ceftriaxone (80 mg/kg once daily) for 14 days in total unless directed otherwise by the results of antibiotic sensitivities.

1.4.1.12 In children younger than 3 months with confirmed bacterial meningitis caused by Group B streptococcus treat with intravenous cefotaxime (50 mg/kg three times daily) for at least 14 days. If the clinical course is complicated[4] consider extending the duration of treatment and consulting an expert in paediatric infectious diseases.

1.4.1.13 In children younger than 3 months with confirmed bacterial meningitis caused by *L monocytogenes* treat with intravenous amoxicillin (50–100 mg/kg daily) or ampicillin (125 mg four times daily) for 21 days in total plus gentamicin for at least the first 7 days.

1.4.1.14 In children younger than 3 months with confirmed bacterial meningitis caused by Gram-negative bacilli treat with intravenous cefotaxime (50 mg/kg three times daily) for at least 21 days unless directed otherwise by the results of antibiotic sensitivities. If the clinical course is complicated[4] consider extending the duration of treatment and consulting an expert in paediatric infectious diseases.

Meningococcal disease

1.4.1.15 In children and young people with confirmed meningococcal disease, treat with intravenous ceftriaxone (80 mg/kg once daily) for 7 days in total unless directed otherwise by the results of antibiotic sensitivities.

[4] For example, if there is poor response to antibiotic therapy, effusion or abscess, or concomitant intraventricular haemorrhage in a premature baby.

1.4.1.16 In children and young people with unconfirmed but clinically suspected meningococcal disease treat with intravenous ceftriaxone (80 mg/kg once daily) for 7 days in total.

1.4.2 Fluids, intubation and vasoactive agents

Fluids for bacterial meningitis

1.4.2.1 Assess children and young people with suspected or confirmed bacterial meningitis for:

- signs of shock
- raised intracranial pressure
- signs of dehydration.

Refer to 'Diarrhoea and vomiting in children' (NICE clinical guideline 84) for assessment of shock and dehydration.

1.4.2.2 Correct any dehydration in children and young people with suspected or confirmed bacterial meningitis using enteral fluids or feeds, or intravenously with isotonic fluids (for example, sodium chloride 0.9% or sodium chloride 0.9% with glucose 5% or dextrose 5%).

1.4.2.3 Do not restrict fluids in children and young people with suspected or confirmed bacterial meningitis unless there are signs of raised intracranial pressure or evidence of increased antidiuretic hormone secretion.

1.4.2.4 Give full-volume maintenance fluids to children and young people with suspected or confirmed bacterial meningitis to avoid hypoglycaemia and maintain electrolyte balance.

1.4.2.5 Use enteral feeds as maintenance fluid in children and young people with suspected or confirmed bacterial meningitis who can tolerate enteral feeds.

1.4.2.6 If intravenous maintenance fluid is required, use isotonic fluids (for example, sodium chloride 0.9% with glucose 5% or dextrose 5%). In neonates use glucose 10% and added sodium for maintenance.

1.4.2.7 Monitor fluid administration and urine output in children and young people with suspected or confirmed bacterial meningitis to ensure adequate hydration and avoid overhydration.

1.4.2.8 Monitor electrolytes and blood glucose regularly (at least daily during the acute phase) in children and young people with suspected or confirmed bacterial meningitis.

1.4.2.9 If there are signs of raised intracranial pressure or evidence of shock in children and young people with suspected or confirmed bacterial meningitis, initiate emergency management for these conditions and discuss ongoing fluid management with a paediatric intensivist.

Intravenous fluid resuscitation

1.4.2.10 In children and young people with suspected meningococcal septicaemia:

- if there are signs of shock give an immediate fluid bolus of 20 ml/kg sodium chloride 0.9% over 5–10 minutes. Give the fluid intravenously or via an intraosseous route and reassess the child or young person immediately afterwards
- if despite the initial 20 ml/kg sodium chloride 0.9% bolus the signs of shock persist, immediately give a second bolus of 20 ml/kg of intravenous or intraosseous sodium chloride 0.9% or human albumin 4.5% solution over 5–10 minutes
- if following two bolus infusions (total 40 ml/kg) the signs of shock persist:
  - immediately give a third bolus 20 ml/kg of intravenous or intraosseous sodium chloride 0.9% or human albumin 4.5% solution over 5–10 minutes

  - call for on-site anaesthetic assistance for urgent tracheal intubation and mechanical ventilation
  - start treatment with vasoactive drugs
  - be aware that some children and young people may require large volumes of fluid over a short period of time to restore their circulating volume and consider giving further fluid boluses at 20 ml/kg of intravenous or intraosseous sodium chloride 0.9% or human albumin 4.5% solution over 5–10 minutes based on clinical signs and appropriate laboratory investigations
- discuss further management with a paediatric intensivist.

Intubation

1.4.2.11 In self-ventilating children and young people with suspected or confirmed bacterial meningitis or meningococcal septicaemia with signs of increased respiratory distress administer 10–15 litre face mask oxygen via a reservoir rebreathing mask.

1.4.2.12 In children and young people with suspected or confirmed bacterial meningitis or meningococcal septicaemia, if there is a threatened loss of airway patency, implement airway-opening manoeuvres, and start bag–valve mask ventilation before tracheal intubation.

1.4.2.13 In children and young people with suspected or confirmed bacterial meningitis or meningococcal septicaemia, administer tracheal intubation and mechanical ventilation for the following indications:

- threatened, or actual loss of airway patency (for instance loss of gag reflex)
- the need for any form of assisted ventilation, for example bag–mask ventilation
- clinical assessment of increased work of breathing
- apnoea
- hypoventilation
- features of respiratory failure, including

  - irregular respiration (for instance Cheyne–Stokes breathing)
  - hypoxia (PaO_2 less than 13 kPa or 97.5 mmHg) in air
  - hypercapnia ($PaCO_2$ greater than 6 kPa or 45 mmHg)
- continuing shock following infusion of 40 ml/kg of resuscitation fluid
- signs of raised intracranial pressure
- impaired mental status
  - a Glasgow Coma Scale drop of 3 or more, or a score of less than 9, or a fluctuation in conscious level
  - moribund state
- control of intractable seizures
- need for stabilisation and management to allow brain imaging or transfer to PICU or another hospital.

1.4.2.14 A healthcare professional with expertise in airway management should undertake tracheal intubation.

1.4.2.15 Use local or national protocols for intubation in children and young people with suspected or confirmed bacterial meningitis or meningococcal septicaemia.

Vasoactive agents

1.4.2.16 If shock remains intractable despite adequate fluid resuscitation (more than 40 ml/kg) and increasing requirements for either intravenous adrenaline or intravenous noradrenaline, or both, consider potential reasons (such as persistent acidosis, incorrect dilution, extravasation) and discuss further management options with a paediatric intensivist.

1.4.2.17 Use local or national protocols for the administration of vasoactive agents in children and young people with suspected or confirmed bacterial meningitis or meningococcal septicaemia.

1.4.3 Corticosteroids for bacterial meningitis

1.4.3.1 Give dexamethasone (0.15 mg/kg to a maximum dose of 10 mg, four times daily for 4 days)[5] as soon as possible if lumbar puncture reveals any of the following:

- frankly purulent CSF
- bacteria on Gram stain
- a CSF white blood cell count greater than 1000/microlitre
- CSF pleocytosis and a protein concentration greater than 1 g/litre.

If tuberculosis is in the differential diagnosis, refer to 'Tuberculosis' (NICE clinical guideline 33) before administering steroids, because steroids may be harmful if given without antituberculous therapy.

1.4.3.2 If dexamethasone is not given before or with the first dose of antibiotics, but is appropriate, administer a first dose within 4 hours wherever possible, but not later than 12 hours.

1.4.3.3 After the first dose of dexamethasone always discuss the decision to continue dexamethasone with a senior paediatrician.

1.4.3.4 Do not use corticosteroids in children younger than 3 months with suspected bacterial meningitis.

1.4.4 Corticosteroids for meningococcal septicaemia

1.4.4.1 Do not treat children and young people with meningococcal septicaemia with high-dose corticosteroids (defined as dexamethasone 0.6 mg/kg/day or an equivalent dose of other corticosteroids).

[5] The dosage given in the recommendation is based on high-quality evidence and is consistent with established clinical practice (see the full guideline for further details). Dexamethasone does not have UK marketing authorisation for use at the dose specified in the recommendation. Such use is an off-label use. Informed consent should be obtained and documented in line with normal standards in emergency care.

1.4.4.2 In children and young people with meningococcal septicaemia and shock that is unresponsive to vasoactive agents, steroid replacement therapy using low-dose corticosteroids (hydrocortisone 25 mg/m^2 four times daily)[6] should be used only when directed by a paediatric intensivist.

1.4.5 Adjunctive therapies

1.4.5.1 Do not use activated protein C or recombinant bacterial permeability-increasing protein in children and young people with meningococcal septicaemia.

1.4.6 Monitoring for deterioration

1.4.6.1 Monitor children and young people with meningococcal disease closely after admission to hospital for signs of deterioration.

1.4.6.2 Be aware that children and young people with meningococcal disease can deteriorate rapidly, regardless of the results of any initial assessment of severity.

1.4.7 Retrieval and transfer to tertiary care

1.4.7.1 Children and young people with suspected or confirmed meningococcal disease who need resuscitation should be discussed with a paediatric intensivist as soon as possible.

1.4.7.2 Transfer of children and young people with suspected or confirmed meningococcal disease to tertiary care should be undertaken by an experienced paediatric intensive care retrieval team comprising medical and nursing staff.

1.4.7.3 Healthcare professionals involved in the treatment of seriously ill children and young people should be trained in the recognition and management of meningococcal disease.

[6] The dosage given in the recommendation is based on high-quality evidence and is consistent with established clinical practice (see the full guideline for further details). Hydrocortisone does not have UK marketing authorisation for use at the dose specified in the recommendation. Such use is an off-label use. Informed consent should be obtained and documented in line with normal standards in emergency care.

1.5 Long-term management

1.5.1 Long-term effects of bacterial meningitis and meningococcal septicaemia

1.5.1.1 Before discharging children and young people with bacterial meningitis or meningococcal septicaemia from hospital:

- consider their requirements for follow-up, taking into account potential sensory, neurological, psychosocial, orthopaedic, cutaneous and renal morbidities, **and**
- discuss potential long-term effects and likely patterns of recovery with the child or young person and their parents or other family members, and provide them with opportunities to discuss issues and ask questions.

1.5.1.2 Offer children and young people with bacterial meningitis or meningococcal septicaemia and their parents or carers:

- information about and access to further care immediately after discharge, **and**
- contact details of patient support organisations including meningitis charities that can offer support, befriending, in-depth information, advocacy, counselling, and written information to signpost families to further help, **and**
- advice on accessing future care.

1.5.1.3 Perform a formal audiological test in children and young people who have had bacterial meningitis or meningococcal septicaemia as soon as possible, preferably before discharge, within 4 weeks of being fit to test.

1.5.1.4 Offer children and young people found to have severe or profound deafness an assessment for cochlear implants.

1.5.1.5 Children and young people who have had bacterial meningitis or meningococcal septicaemia should be reviewed by a paediatrician

with the results of their hearing test 4–6 weeks after discharge from hospital to discuss morbidities associated with their condition and offered referral to the appropriate services. The following morbidities should be specifically considered:

- hearing loss
- orthopaedic complications (damage to bones and joints)
- skin complications (including scarring from necrosis)
- psychosocial problems
- neurological and developmental problems
- renal failure.

1.5.1.6 Inform the child's or young person's GP, health visitor and school nurse (for school-age children and young people) about their bacterial meningitis or meningococcal septicaemia.

1.5.1.7 Healthcare professionals with responsibility for monitoring the child's or young person's health should be alert to possible late-onset sensory, neurological, orthopaedic and psychosocial effects of bacterial meningitis and meningococcal septicaemia.

1.5.2 Immune testing

1.5.2.1 Test children and young people for complement deficiency if they have had either:

- meningococcal disease caused by serogroups other than B, **or**
- previous serious bacterial infections (including meningococcal disease).

1.5.2.2 Children and young people with recurrent episodes of meningococcal disease should be assessed by a specialist in infectious disease or immunology.

1.5.2.3 Do not test children and young people for complement deficiency who have had either:

- meningococcal disease caused by serogroup B meningococcus, **or**
- unconfirmed meningococcal disease.

1.5.2.4 If a child or young person who has had meningococcal disease has a parent or sibling with a history of complement deficiency, test for complement deficiency.

1.5.2.5 If a child or young person who has had meningococcal disease is found to have complement deficiency, test their parents and siblings for complement deficiency.

1.5.2.6 Testing for complement deficiency should follow laboratory protocols.

1.5.2.7 Refer children and young people with complement deficiency to a healthcare professional with expertise in the management of the condition.

1.5.2.8 Do not test children and young people for immunoglobulin deficiency if they have had meningococcal disease, unless they have a history suggestive of an immunodeficiency.

2 Notes on the scope of the guidance

NICE guidelines are developed in accordance with a scope that defines what the guideline will and will not cover. The scope of this guideline is available from www.nice.org.uk/MeningitisChildrenScope

How this guideline was developed

NICE commissioned the National Collaborating Centre for Women's and Children's Health to develop this guideline. The Centre established a Guideline Development Group (see appendix A), which reviewed the evidence and developed the recommendations. An independent Guideline Review Panel oversaw the development of the guideline (see appendix B).

There is more information about how NICE clinical guidelines are developed on the NICE website (www.nice.org.uk/guidelinesprocess). A booklet, 'How NICE clinical guidelines are developed: an overview for stakeholders, the public and the NHS' (fourth edition, published 2009), is available from NICE publications (phone 0845 003 7783 or email publications@nice.org.uk and quote reference N1739).

3 Implementation

NICE has developed tools to help organisations implement this guidance (see www.nice.org.uk/CGXX).

4 Research recommendations

The Guideline Development Group has made the following recommendations for research, based on its review of evidence, to improve NICE guidance and patient care in the future. The Guideline Development Group's full set of research recommendations is detailed in the full guideline (see section 5).

4.1 Symptoms and signs of bacterial meningitis and meningococcal disease

What are the symptoms and signs of bacterial meningitis and meningococcal disease in children and young people aged under 16 years that differentiate between these conditions and minor self-limiting infections (including those characterised by fever)?

Why this is important

Research is needed from primary and secondary care settings on the diagnostic accuracy of symptoms and signs suggestive of bacterial meningitis and meningococcal disease in children and young people. The research should focus on identifying individual symptoms and signs, or groups of symptoms and signs, that are effective as predictors of bacterial meningitis and meningococcal disease and which differentiate effectively between these conditions and minor self-limiting infections. The research should include consideration of the effectiveness of symptoms and signs of acute feverish illness as predictors of meningococcal disease. Consideration should also be given to the age of the child or young person (in terms of the relevance of particular symptoms and signs) and the clinical setting at presentation. Suitable study designs would include diagnostic accuracy studies as well as observational studies (such as case–control studies), and the research could include a systematic review of studies that have already been published.

4.2 Predictive value of blood test results and cerebrospinal fluid findings

What are the normal ranges for blood and CSF parameters in children and young people in the UK?

Why this is important

Bacterial meningitis is a rare disease that is not easily distinguishable clinically from aseptic meningitis. It is, however, important to recognise those children who are most likely to have bacterial meningitis to direct appropriate management of the condition and to avoid inappropriate treatment of aseptic meningitis. Since the introduction of vaccines to protect against Hib, meningococcus serogroup C and pneumococcus, no high-quality studies involving previously healthy children and young people have been conducted in the UK to determine normal ranges for blood test results or CSF findings in bacterial and aseptic meningitis. Such studies are needed to provide reference values to help interpret blood test results and CSF findings in children (especially neonates) and young people with suspected bacterial meningitis.

4.3 Albumin and crystalloid solutions for fluid resuscitation

How effective is albumin 4.5% solution compared with crystalloid saline 0.9% solution for fluid resuscitation in children and young people with septic shock?

Why this is important

There are theoretical reasons why albumin solution may be more effective than crystalloid solution in children and young people with septic shock. However, no clinical studies have evaluated the effectiveness of albumin solution in children and young people with meningococcal disease. Concerns about the safety of colloids such as albumin solution led to a widespread change in clinical practice in the 1990s to using crystalloid solutions, despite a lack of evidence of equivalent effectiveness. Although albumin solution is considerably more expensive than crystalloid solution, a small additional benefit of albumin over crystalloid (one death prevented in more than 14,000 treated cases) would make the use of albumin solution cost effective. Randomised controlled trials are therefore needed to compare the effectiveness of albumin and crystalloid solutions in children and young people with septic shock.

4.4 Adjunctive corticosteroid treatment

What is the effectiveness of corticosteroids as an adjunct to antibiotic treatment in neonates with suspected or confirmed bacterial meningitis?

Why this is important

Neonatal bacterial meningitis is associated with high morbidity, despite the availability of antibiotics that are highly effective against the leading causes of bacterial meningitis in this age group. New approaches to management are needed because there are currently no vaccines to protect against infection from the causative organisms. Corticosteroids are effective as an adjunct to antibiotic treatment in older children with meningitis caused by Hib, and in adults with bacterial meningitis but there is insufficient evidence to support a recommendation for adjunctive corticosteroid treatment in neonates. Extrapolation from older age groups would be inappropriate because the spectrum of organisms causing infection in neonates is different, and the

impact on the developing brain of the causative organisms during inflammation may not be the same. A large-scale randomised controlled trial is therefore needed to compare the effectiveness of antibiotic treatment plus corticosteroids with antibiotic treatment alone in neonates with suspected or confirmed bacterial meningitis.

4.5 Steroid replacement treatment

How effective is steroid replacement treatment in children and young people with vasopressor-unresponsive shock caused by septicaemia, including meningococcal septicaemia?

Why this is important

Well-conducted but relatively small randomised clinical trials involving adults only suggest that low-dose corticosteroid replacement treatment may ameliorate haemodynamic failure and inflammatory dysregulation associated with severe sepsis. Such treatment may also improve outcomes following septic shock. Severe sepsis in children and young people differs from that in adults in that multiple-organ dysfunction is less common in children and young people, and mortality is lower. A randomised controlled trial involving children and young people is needed to evaluate the effectiveness of corticosteroid replacement treatment. Studies involving adults only suggest that those with normal adrenal function have worse outcomes if they receive steroids than those with adrenal dysfunction, and so the proposed trial should consider whether testing for adrenal dysfunction before starting steroid replacement treatment improves outcomes.

5 Other versions of this guideline

5.1 Full guideline

The full guideline, ‘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’ contains details of the methods and evidence used to develop the guideline. It is published by the National Collaborating Centre for Women’s

and Children's Health, and is available from www.ncc-wch.org.uk, our website (www.nice.org.uk/CGXXXfullguideline). **[Note: these details will apply to the published full guideline.]**

5.2 Quick reference guide

A quick reference guide for healthcare professionals is available from www.nice.org.uk/CGXXXquickrefguide

For printed copies, phone NICE publications on 0845 003 7783 or email publications@nice.org.uk (quote reference number N1XXX). **[Note: these details will apply when the guideline is published.]**

5.3 'Understanding NICE guidance'

A summary for patients and their parents and carers ('Understanding NICE guidance') is available from www.nice.org.uk/CGXXXpublicinfo

For printed copies, phone NICE publications on 0845 003 7783 or email publications@nice.org.uk (quote reference number N1XXX). **[Note: these details will apply when the guideline is published.]**

We encourage NHS and voluntary sector organisations to use text from this booklet in their own information about bacterial meningitis and meningococcal disease.

6 Related NICE guidance

Published

Intrapartum care. Care of healthy women and their babies during childbirth. NICE clinical guideline 55 (2007). Available from www.nice.org.uk/CG55

Feverish illness in children. Assessment and initial management in children younger than 5 years. NICE clinical guideline 47 (2007). Available from www.nice.org.uk/CG47

Tuberculosis. Clinical diagnosis and management of tuberculosis, and measures for its prevention and control. NICE clinical guideline 33 (2006). Available from www.nice.org.uk/CG33

The epilepsies. The diagnosis and management of the epilepsies in adults and children in primary and secondary care. NICE clinical guideline 20 (2004). Available from www.nice.org.uk/CG20

7 Updating the guideline

NICE clinical guidelines are updated so that recommendations take into account important new information. New evidence is checked 3 years after publication, and healthcare professionals and patients are asked for their views; we use this information to decide whether all or part of a guideline needs updating. If important new evidence is published at other times, we may decide to do a more rapid update of some recommendations.

Appendix A: The Guideline Development Group

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Appendix B: The Guideline Review Panel

The Guideline Review Panel is an independent panel that oversees the development of the guideline and takes responsibility for monitoring adherence to NICE guideline development processes. In particular, the panel ensures that stakeholder comments have been adequately considered and responded to. The panel includes members from the following perspectives: primary care, secondary care, lay, public health and industry.

[NICE to add]

[Name; style = Unnumbered bold heading]
[job title and location; style = NICE normal]

Appendix C: The algorithms

[NB NICE to add a note here if the algorithms are being published as a separate file on the website]

[Add a hyperlink to the QRG here if relevant]