NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

Quality standards

Briefing paper: Meningitis (bacterial) and meningococcal disease

Quality Standards Advisory Committee meeting: 9 April 2024

Contents

1 Introduction

This briefing paper presents a structured overview of potential quality improvement areas for meningitis (bacterial) and meningococcal disease. It provides the committee with a basis for discussing and prioritising quality improvement areas for development into draft quality statements and measures for public consultation.

This briefing paper includes a brief description of the topic, a summary of each of the suggested quality improvement areas and supporting information.

Recommendations selected from the key development source are included to help the committee in considering potential statements and measures.

1.1 Development source

The key development source referenced in this briefing paper is:

NICE's updated guideline on meningitis (bacterial) and meningococcal disease: recognition, diagnosis and management (March 2024).

2 Overview

2.1 Focus of quality standard

This quality standard will cover the recognition, diagnosis and management of meningitis (bacterial) and meningococcal disease in all populations. It will replace the NICE quality standard for meningitis (bacterial) and meningococcal septicaemia in children and young people (QS19).

2.2 Definition

Bacterial meningitis is an inflammation of the membranes that surround the brain and the spinal cord, caused by bacterial infection. Meningococcal disease is infection with Neisseria meningitidis. It can result in meningococcal meningitis or meningococcal septicaemia, or a combination of both.

In this quality standard, and NICE's guideline on meningitis (bacterial) and meningococcal disease, the term 'meningococcal disease' means illness caused by an invasive meningococcal infection, including bloodstream infection and meningitis.

2.3 Incidence, prevalence and complications

Bacterial meningitis and meningococcal disease are rare.

There are 12 capsular groups of meningococci. B, C, W, and Y were historically the most common in the UK, however, after the introduction of the meningococcal C vaccination programme in 1999 which reduced cases by 96%, group B (MenB) now accounts for the majority of cases.

The UK Health Security Agency reported that in 2021/22 (July – June) there were 205 cases of invasive meningococcal disease (IMD) in England. In 2020/21 there was an exceptionally low number of 80 cases when COVID-19 pandemic restrictions were in place. There were 463 cases in 2019/20 and 531 in 2018/19.

In England, in 2021/22, MenB accounted for 87% (179/205) of all cases, MenW 6% (13/205) and MenY 1% (2/205). One case each of MenC, MenA and MenE were reported and 8 cases were not identified.

As confirmed above, MenB is the most common form of meningitis in England and in 2021/22 it was the cause of the majority of IMD cases in most age groups:

- 100% of cases (34) in infants
- 89% of cases (16/18) in 1 to 4 year olds
- 100% of cases (8) in 5 to 14 year olds
- 94% of cases (64/68) in 15 to 19 year olds
- 50% of cases (11/22) in 20 to 24 year olds
- 67% of cases (37/55) in people aged 25 years and over.

Adults aged 25 years and older accounted for all MenC and MenY cases, 85% of MenW cases and 21% of MenB cases.

The mortality rate of invasive meningococcal disease was 6% (12 people) in 2021/22.

The NHS website states that it is estimated up to 1 person in every 2 or 3 who survives bacterial meningitis is left with 1 or more permanent problems. Some of the most common complications associated with meningitis include loss of limbs, hearing or vision loss, epilepsy, problems with memory and concentration and kidney problems.

2.4 Current service delivery and management

Vaccination programmes

The UK Health Security Agency notes that infants in the UK have been offered routine MenB immunisation (4CMenB) since September 2015. In England in 2021/22 (April – March) it was estimated that uptake of this was 91.5% of infants receiving the initial 2 doses by 12 months of age and 88% receiving their 12-month booster by 24 months of age. This vaccination programme has been shown to be highly effective in preventing MenB disease in infants and toddlers.

The MenACWY vaccine was added to the national immunisation programme in England in August 2015 due to a rise in MenW cases. This is part of the routine adolescent school programme and coverage for young people routinely offered this vaccine in the 2020 to 2021 school year was 76.5% (year 9) and 80.9% (year 10). This vaccination programme has led to large reductions in invasive meningococcal disease (IMD) through a combination of direct and indirect protection. This population remain eligible for opportunistic MenACWY vaccination until their 25th birthday and this is particularly important if they are entering higher education institutions where their risk of disease is much higher than that of their peers.

Clinical practice and follow-up

There are variations in clinical practice for bacterial meningitis and meningococcal disease. There is also variation in follow-up and management for complications.

2.5 Resource impact

We do not expect this quality standard to have a significant impact on resources. When NICE's guideline on meningitis (bacterial) and meningococcal disease: recognition, diagnosis and management was updated in March 2024, a resource impact statement was produced which noted that:

- the resource impact of implementing any single guideline recommendation will be less than £1 million per year in England (or approximately £1,800 per 100,000 population based on a population for England of 56.6m people) **and**
- the resource impact of implementing the whole guideline in England will be less than £5 million per year (or approximately £9,100 per 100,000 population, based on a population for England of 56.6m people).

This is because the population covered by the guideline is small, around 560 people per year or 1 per 100,000 population. Overall the recommendations are in line with existing practice although there are some possibilities for savings through reduced

length of stay in hospital and using treatments which require fewer administrations. These savings are not expected to be significant due to the small population size.

3 Summary of suggestions

3.1 Responses

In total 12 registered stakeholders responded to the 2-week engagement exercise. Topic engagement was extended to allow stakeholders more time to provide their 5 key areas for quality improvement, as there were some delays with the publication of the updated guideline and therefore some delays in beginning the development of the updated quality standard.

- 9 stakeholders suggested areas
- 3 stakeholders had no comments
- 5 specialist committee members suggested areas

The responses have been summarised in table 1 for further consideration by the committee.

Table 1 Summary of suggested quality improvement areas

Area for improvement	Stakeholders
Antibiotics prior to hospital admission and recognition of bacterial meningitis and meningococcal disease • Antibiotics before arrival at hospital • Recognising bacterial meningitis and meningococcal disease	NHSELD, PCCS, SCM1, SCM2, SCM3.
Investigating suspected bacterial meningitis or meningococcal disease in hospital • Lumbar puncture • CT scans • Initial assessment and antibiotic treatment time in hospital • Cerebrospinal fluid and blood samples	bM, MRF, NIHR, RCEM, SAM, SCM1, SCM3, SCM4, SCM5
Treatment for bacterial meningitis or meningococcal disease in hospital • Antibiotics • Cortisteroids	NIHR, SCM1, SCM3, SCM5
Discharge and follow up • Preparing for hospital discharge • Care after hospital discharge	PCCS, MN, MRF, SCM1, SCM3, SCM4, SCM5
Information and support • Safety netting information • Information and support after diagnosis	MN, MRF, NHSELD, SCM1, SCM3
Additional areas • Impacts on global child health • Martha's rule • Vaccination • Reasonable adjustments and language and communication • Amendments to NICE's guideline on fever in under 5s • Pathogen typing and investigation of clusters of infection	RCPCH, PCCS, NHSEOCSO, NHSEIPC, NHSELD, NHSEPCC

Abbreviations:

- bM, bioMerieux
- BSAC, British Society for Antimicrobial Chemotherapy
- MN, Meningitis Now
- MRF, Meningitis Research Foundation
- NHSELD, NHS England Learning Disabilities Team
- NHSEIPC, NHS England Infection Prevention and Control Team
- NHSEOCSO, NHS England Office of the Chief Scientific Officer
- NHSEPCC, NHS England Primary Care Commissioning Team
- NIHR, National Institute for Heath and Care Research Global Health Research Unit on Mucosal Pathogens at UCL
- PCCS, Paediatric Critical Care Society
- SAM, Society for Acute Medicine
- RCEM, Royal College of Emergency Medicine
- RCPCH, Royal College of Paediatrics and Child Health
- RCN, Royal College of Nursing
- RCP, Royal College of Physicians
- SCM, Specialist Committee Member.

Full details of all the suggestions provided are given in appendix 1 for information.

4 Suggested improvement areas

Section 4 presents a summary of the suggested improvement areas, with provisional recommendations that may support statement development and information on current UK practice.

4.1 Antibiotics prior to hospital admission and recognition of bacterial meningitis and meningococcal disease

Antibiotics before arrival at hospital

A stakeholder suggested giving antibiotics as soon as possible before admission to hospital for bacterial meningitis or meningococcal disease. They also noted that they should be given for meningococcal disease if there is likely to be a clinically significant delay in transfer to hospital.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.2.3 Do not delay transfer to hospital to give antibiotics to people with suspected or strongly suspected bacterial meningitis or meningococcal disease.

1.2.4 If there is likely to be a clinically significant delay in transfer to hospital for people with strongly suspected bacterial meningitis, give intravenous or intramuscular ceftriaxone or benzylpenicillin outside of hospital.

1.2.5 For people with strongly suspected meningococcal disease, give intravenous or intramuscular ceftriaxone or benzylpenicillin as soon as possible outside of hospital, unless this will delay transfer to hospital.

Current UK practice

No published studies on current practice were highlighted for this suggested area for quality improvement; this area is based on stakeholder's knowledge and experience.

Recognising bacterial meningitis and meningococcal disease

A stakeholder suggested that an assessment of signs and symptoms, including a full examination of children for a non-blanching rash, for meningitis and meningococcal disease should be completed. Another stakeholder commented that the new national paediatric early warning system (PEWS) for recognising unwell children should be used.

A stakeholder noted that older adults presenting to emergency care pathways should be routinely screened and comprehensively assessed for causes of delirium using standardised measures and pathways. They also noted that older adults presenting to emergency care acutely unwell should be rapidly and comprehensively assessed for bacterial meningitis and meningococcal disease by clinicians with expertise in assessment of acute frailty syndromes.

A stakeholder noted that families and children may experience barriers in primary care, including not being listened to.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.1.1 When considering a diagnosis of bacterial meningitis or meningococcal disease, be aware that:

- they are rapidly evolving conditions
- they can present with non-specific symptoms and signs (without the red flag combination for bacterial meningitis in recommendation 1.1.4 or any of the red flag symptoms for meningococcal disease in recommendation 1.1.19), particularly in young babies and older adults
- they may be difficult to distinguish from other infections with similar symptoms and signs
- symptoms and signs may be more difficult to identify in young people and young adults, who may appear well at presentation
- meningitis and sepsis can occur at the same time, particularly in people with a rash.

1.1.2 Complete an assessment of signs, symptoms and risk factors using:

- the section on when to suspect bacterial meningitis, including recommendation 1.1.4 on the red flag combination, and
- the section on when to suspect meningococcal disease, including recommendation 1.1.19 on the red flag symptoms, and
- family member and carer reports of symptoms, if relevant.

1.1.4 Strongly suspect bacterial meningitis in people with all the symptoms in the red flag combination:

- fever

- headache
- neck stiffness
- altered level of consciousness or cognition (including confusion or delirium).

1.1.5 Bacterial meningitis can still be strongly suspected based on clinical assessment, even in people who do not have all the symptoms in the red flag combination.

1.1.6 Suspect bacterial meningitis based on assessment of the symptoms and signs in table 1 (for babies, children and young people) or table 2 (for adults), and the section on risk factors. Take into account that:

- bacterial meningitis can present with any of these symptoms and signs
- the more symptoms and signs a person has, the more likely it is that they have bacterial meningitis.

1.1.7 If you suspect or strongly suspect bacterial meningitis, transfer the person to hospital as an emergency (see the recommendations on transfer to hospital).

No NICE recommendations have been identified on the use of PEWS.

Current UK practice

A study on the assessment of healthcare delivery in the early management of bacterial meningitis in UK young infants focussed on infants aged under 90 days who were diagnosed with bacterial meningitis between July 2010 – July 2013. This found that 30% (20/66) of those infants who were admitted from home received inappropriate pre-hospital management.

A 2018 report on Spotting a seriously ill child produced by the Meningitis Research Foundation noted that studies spanning the last two decades have shown difficulties with meningitis diagnosis. It referenced Clinical recognition of meningococcal disease in children and adolescents, published in 2006, which found that around half (49%) of children who had the most common type of bacterial meningitis were sent home after their first visit to a GP or health professional and not admitted to hospital. They noted that in this study the average time to hospital admission was around 19 hours. While the rash and impaired consciousness commonly associated with meningococcal disease developed late in the children in this study, at around 13-22 hours after their first symptoms, 72% of cases showed early symptoms that could have been picked up before they went to hospital including leg pains, cold hands and feet and abnormal skin colour that first developed at around 8 hours.

It also referenced Clinical characteristics and risk factors for poor outcome in infants less than 90 days of age with bacterial meningitis in the United Kingdom and Ireland

which found that between July 2010 – July 2011, 30% of infants under 90 days of age were assessed to have received inappropriate pre-hospital management which resulted in delays in seeking help despite the presence of worrying clinical features.

No current practice was identified on the routine screening and comprehensive assessment of older people for the causes of delirium, or on assessment by clinicians with expertise in assessment of acute frailty syndromes.

Issues for consideration

For discussion:

- What is the priority for improvement? Is this antibiotics before hospital admission or is it recognition of bacterial meningitis or meningococcal disease?
- What is the key action that will lead to improvement?
- Can we develop a specific, measurable statement?

For decision:

- Should this area be prioritised for inclusion in the quality standard?
- If so, should we focus on a specific population, such as older people or children as highlighted at topic engagement?

4.2 Investigating suspected bacterial meningitis or meningococcal disease in hospital

Lumbar puncture

Stakeholders highlighted the importance of performing a lumbar puncture and blood culture before starting antibiotics, unless it will cause a clinically significant delay to starting antibiotics. Lumbar puncture should be undertaken within an hour if bacterial meningitis is suspected and before starting antibiotics.

A stakeholder noted that there are a high number of cases which do not get a confirmed microbiological diagnosis. It can take several days from doing a lumbar puncture to receiving results, despite availability of rapid PCR methods, due to factors such as sending a cerebrospinal fluid (CSF) sample to an offsite laboratory. This can directly impact clinical management, such as discontinuation of unnecessary antimicrobials, and potentially reduction in hospital length of stay. They also noted that rapid pathogen identification will support appropriate steroids use.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.4.1 A senior clinical decision maker should perform an initial assessment and ensure that:

- antibiotics start within 1 hour of the person with suspected bacterial meningitis arriving at hospital, and in line with the section on antibiotics for bacterial meningitis in hospital
- blood tests and lumbar puncture are performed before starting antibiotics (if it is safe to do so and will not cause a clinically significant delay to starting antibiotics), and in line with the sections on blood tests and lumbar puncture.

1.4.5 Do not rule out bacterial meningitis based only on a normal CRP, PCT, or white blood cell count.

1.4.8 Take bloods, give antibiotics and stabilise the person before imaging.

1.4.9 Perform the lumbar puncture before starting antibiotics, unless it is not safe to do so or it will cause a clinically significant delay to starting antibiotics.

1.4.10 If the person has started on antibiotics before having a lumbar puncture, perform a lumbar puncture as soon as possible (if it is safe to perform).

1.4.11 Treat and stabilise any of the following before performing a lumbar puncture:

- unprotected airway
- respiratory compromise
- shock
- uncontrolled seizures
- bleeding risk.

1.4.12 Do not perform lumbar puncture if there is:

- extensive or rapidly spreading purpura
- infection at the lumbar puncture site
- risk factors for an evolving space-occupying lesion (follow recommendation 1.4.7 on imaging)
- any of these symptoms or signs of raised intracranial pressure (follow recommendation 1.4.7 on imaging):
    - new focal neurological features (including seizures or posturing)
    - abnormal pupillary reactions
    - a Glasgow Coma Scale (GCS) score of 9 or less, or a progressive and sustained or rapid fall in level of consciousness.

1.4.14 Perform the following cerebrospinal fluid investigations in people with suspected bacterial meningitis:

- red and white cell count and cell type (including differential white cell count)
- total protein
- glucose concentration (to calculate cerebrospinal fluid to blood glucose ratio)
- microscopy for bacteria (using gram stain)
- microbiological culture and sensitivities
- PCR for relevant pathogens.

1.5.3 Perform the following blood tests for people with suspected meningococcal disease:

- blood culture

- white blood cell count (including neutrophils)
- blood C-reactive protein (CRP), or procalcitonin (PCT) if CRP is not available
- lactate
- whole-blood diagnostic polymerase chain reaction (PCR), including meningococcal and pneumococcal.

1.6.2 If it is safe to do so and will not cause a clinically significant delay to starting antibiotics, perform a lumbar puncture before giving antibiotics (see the sections on lumbar puncture and cerebrospinal fluid investigations).

Previous quality statement

NICE's quality standard on meningitis (bacterial) and meningococcal septicaemia in children and young people:

Statement 5: Children and young people with suspected bacterial meningitis have a lumbar puncture.

Current UK practice

A study on the clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017 was carried out on behalf of the National Infection Trainees Collaborative for Audit and Research (NITCAR). This study looked at the care received by 1471 people at 64 hospitals throughout the UK and Ireland. 303 of the people in the study were confirmed as having bacterial meningitis. It found that 45% of patients had blood cultures taken within an hour of admission, 0.5% had a lumbar puncture within 1 hour and 26% within 8 hours.

CT scans

A stakeholder noted that CT scans should not be performed routinely before lumbar puncture. This should only happen if necessary, for example, when there are focal neurological signs, abnormal pupillary reactions or a rapidly deteriorating level of consciousness.

A stakeholder suggested reducing unnecessary CT scans in suspected meningitis. They noted current guidance is that CT head scanning is unnecessary unless certain red flags are present, however they stated that in most hospitals, most patients have a CT scan.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.4.6 Do not routinely perform neuroimaging before lumbar puncture.

1.4.7 Perform imaging if the person has:

- risk factors for an evolving space-occupying lesion or
- any of these symptoms or signs of raised intracranial pressure:
    - new focal neurological features (including seizures or posturing)
    - abnormal pupillary reactions
    - a Glasgow Coma Scale (GCS) score of 9 or less, or a progressive and sustained or rapid fall in level of consciousness.

  Do not perform a lumbar puncture until these factors have been resolved.

Current UK practice

No published studies on current practice were highlighted for this suggested area for quality improvement; this area is based on stakeholder's knowledge and experience.

Initial assessment and antibiotic treatment time in hospital

Stakeholders noted that people attending hospital with symptoms or signs of meningitis, should have an initial rapid triage, to enable escalation to a senior clinical decision maker. Once someone is identified as potentially having meningitis, they should be seen by a senior decision maker within one hour.

Several stakeholders highlighted the importance of intravenous antibiotics being given within 1 hour of arrival at hospital for people with suspected meningitis or meningococcal disease.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.4.1 A senior clinical decision maker should perform an initial assessment and ensure that:

- antibiotics start within 1 hour of the person with suspected bacterial meningitis arriving at hospital, and in line with the section on antibiotics for bacterial meningitis in hospital
- blood tests and lumbar puncture are performed before starting antibiotics (if it is safe to do so and will not cause a clinically significant delay to starting antibiotics), and in line with the sections on blood tests and lumbar puncture.

1.5.1 A senior clinical decision maker should perform an initial assessment and ensure that:

- antibiotics start within 1 hour of the person with suspected meningococcal disease arriving at hospital, and in line with the section on antibiotics for meningococcal disease in hospital
- blood tests are performed before starting antibiotics, and in line with the section on blood tests.

Previous quality statements

NICE's quality standard on meningitis (bacterial) and meningococcal septicaemia in children and young people:

Statement 3: Children and young people presenting with a petechial rash receive antibiotics in accordance with NICE guidance.

Statement 4: Children and young people with suspected bacterial meningitis or meningococcal septicaemia receive intravenous or intraosseous antibiotics within an hour of arrival at hospital.

Current UK practice

A study on the clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017 found that, for those people with confirmed bacterial meningitis, 36% received antibiotics within 1 hour of arrival at hospital.

A study on the assessment of healthcare delivery in the early management of bacterial meningitis in UK young infants focussed on infants aged under 90 days who were diagnosed with bacterial meningitis between July 2010 – July 2013. This found that the median time from triage to receipt of first antibiotic dose was 2.0 hours, though this was significantly shorter in infants with fever or seizures at presentation (median time to antibiotics 1.7 hours) compared with those without (median time to antibiotics 4.2 hours).

Cerebrospinal fluid (CSF) and blood samples

Stakeholders raised the importance of performing timely and appropriate tests on cerebrospinal fluid and blood samples including PCR for relevant pathogens. They explained that it is important to identify the pathogen in order to correctly target treatment, to increase the chances of a good recovery, and decreasing exposure to unnecessary antibiotics and prolonged hospital stays in cases that turn out to be viral in origin.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.4.4 Perform the following blood tests for people with suspected bacterial meningitis:

- blood culture
- white blood cell count (including neutrophils)
- blood C-reactive protein (CRP), or procalcitonin (PCT) if CRP is not available
- blood glucose
- whole-blood diagnostic polymerase chain reaction (PCR), including meningococcal and pneumococcal
- HIV test (in line with recommendations 1.10.1 and 1.10.2).

1.4.15 Store the remaining cerebrospinal fluid in case more tests are needed.

1.5.3 Perform the following blood tests for people with suspected meningococcal disease:

- blood culture
- white blood cell count (including neutrophils)
- blood C-reactive protein (CRP), or procalcitonin (PCT) if CRP is not available
- lactate
- whole-blood diagnostic polymerase chain reaction (PCR), including meningococcal and pneumococcal.

Previous quality statement

NICE's quality standard on meningitis (bacterial) and meningococcal septicaemia in children and young people:

Statement 7: Children and young people with suspected bacterial meningitis or meningococcal septicaemia have whole blood meningococcal polymerase chain reaction (PCR) testing.

Current UK practice

A study on the clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017 found that 28% of adults with suspected community-acquired bacterial meningitis had bacterial molecular diagnostic tests on cerebrospinal fluid.

Issues for consideration

For discussion:

- What is the priority for improvement? Carrying out lumbar puncture, delays caused by carrying out neuroimaging if this isn't needed, antibiotic treatment time or ensuring the identification of the pathogen?
- What is the key action that will lead to improvement?
- If lumbar puncture is the key area for improvement, is it realistic that this could happen before administration of antibiotics which should be given within 1 hour of arrival at hospital?
- Note: no recommendations on a rapid triage but there are recommendations on antibiotic administration within 1 hour of arrival in hospital and on lumbar puncture.
- Could we focus on a specific audience or setting?
- Can we develop a specific, measurable statement? Note: previously there were 4 quality statements on these areas. These were on lumbar puncture, giving antibiotics, timing of antibiotics and PCR testing.

For decision:

- Should this area be prioritised for inclusion in the quality standard?
- If so, which area will have the most significant impact?

4.3 Treatment for bacterial meningitis or meningococcal disease in hospital

Antibiotics

A stakeholder noted the importance of early and prompt initiation of treatment, highlighting NICE recommendation 1.6.5 on ceftriaxone.

A stakeholder noted that intravenous amoxicillin should be given in addition to ceftriaxone or cefotaxime for people with risk factors for Listeria monocytogenes.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.6.5 For suspected bacterial meningitis when the causative organism has not been identified:

- give ceftriaxone (use the highest doses recommended by the BNF or BNFC or refer to local antimicrobial guidance)
- if ceftriaxone is contraindicated, consider cefotaxime (see the BNFC for contraindications to ceftriaxone for pre-term babies under 41 weeks corrected gestational age).

1.6.6 Give intravenous amoxicillin in addition to ceftriaxone or cefotaxime for people with risk factors for Listeria monocytogenes.

Current UK practice

A study on the clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017 noted that 55% of adults aged 60 years or over and 31% of immunocompromised patients received anti-Listeria antibiotics.

Cortisteroids

Stakeholders highlighted the importance of giving intravenous dexamethasone to people with strongly suspected or confirmed bacterial meningitis. One stakeholder commented that this should be given with or before the first dose of antibiotics if possible or as soon as possible and within 12 hours of antibiotics being given.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.8.1 For people over 3 months with strongly suspected or confirmed bacterial meningitis, give intravenous dexamethasone.

1.8.5 For people receiving dexamethasone:

- give the first dose with or before the first dose of antibiotics if possible
- however, do not delay antibiotics to wait for dexamethasone to be started
- if dexamethasone is delayed for less than 12 hours after the start of antibiotics, give dexamethasone as soon as possible
- if dexamethasone is delayed for more than 12 hours after the start of antibiotics, get advice from an infection specialist and decide whether dexamethasone is still likely to provide benefit.

Current UK practice

A study on the clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017 found that 21% of adults with suspected community-acquired meningitis received steroids.

Issues for consideration

For discussion:

- Are one of these areas a key priority for improvement? Giving ceftriaxone, also giving IV amoxicillin if there are risk factors for Listeria monocytogenes or giving IV dexamethasone?
- If so, what is the key action that will lead to improvement? If it is dexamethasone, is the priority the timing of administration?
- Should we focus on a specific population?
- Can we develop a specific, measurable statement?

For decision:

- Should this area be prioritised for inclusion in the quality standard?

4.4 Discharge and follow up

Preparing for hospital discharge

A stakeholder noted the importance of ensuring early detection of compartment syndrome and need for rehabilitation including psychological support for people who have had meningitis and their families.

Another stakeholder noted that timely hearing test assessment is not carried out routinely for all people, especially adults, who have had bacterial meningitis.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.11.4 Consider referral for psychological interventions, for people with bacterial meningitis or meningococcal disease who need specialist psychological support.

1.12.1 Identify follow-up needs for people who have had bacterial meningitis or meningococcal disease, taking into account potential cognitive, neurological, developmental, orthopaedic, skin, hearing, psychosocial, education, and renal complications.

1.12.3 Refer children, young people and adults to psychological services for cognitive and psychological support if follow-up needs have been identified.

1.12.5 For people with acute orthopaedic complications (such as amputation):

- arrange follow-up with an orthopaedic surgeon after discharge
- consider referral to psychological services.

1.12.7 Offer an audiological assessment within 4 weeks of the person being well enough for testing (and preferably before discharge).

1.12.8 Offer children, young people and adults with severe or profound deafness an urgent assessment for cochlear implants.

For further guidance on cochlear implants, see the NICE technology appraisal guidance on cochlear implants for children and adults with severe to profound deafness.

1.12.12 The hospital team should coordinate with the following professionals for care after discharge:

- tertiary and primary care and other specialists

- allied professionals and community teams that will be involved in follow-up (for example audiology, speech and language therapy and psychology departments).

1.12.14 Consider referral to psychosocial support for people who have had bacterial meningitis or meningococcal disease and their family members and carers.

No recommendations relating to the identification of compartment syndrome or psychological support for families were identified.

Previous quality statement

NICE's quality standard on meningitis (bacterial) and meningococcal septicaemia in children and young people:

Statement 13: Children and young people who have had bacterial meningitis or meningococcal septicaemia have an audiological assessment before discharge.

Current UK practice

A study on the assessment of healthcare delivery in the early management of bacterial meningitis in UK young infants focussed on infants aged under 90 days who were diagnosed with bacterial meningitis between July 2010 – July 2013. This found that a hearing test was not performed in 23% of cases, and when it was performed, this was delayed by 4 weeks or longer in 41% of cases.

Care after hospital discharge

Stakeholders noted that people who survive bacterial meningitis and meningococcal disease can be left with a wide range of impairments that may not always be apparent at discharge. They therefore highlighted the importance of people having an outpatient review within 4 - 6 weeks of discharge from hospital noting that currently, not everyone who has had meningitis is offered a follow up appointment.

Stakeholders noted that babies under 12 months at the onset of illness should have an additional review 1 year after discharge from hospital as it is not always possible to identify developmental or neurological problems in very young babies at the appointment 6 weeks following discharge.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.13.1 For babies, children and young people who have had bacterial meningitis or meningococcal disease, arrange for a review with a paediatrician at 4 to 6 weeks after discharge from hospital. As part of this review, cover:

- the results of their audiological assessment, and whether cochlear implants are needed
- damage to bones and joints
- skin complications (including scarring from necrosis)
- psychosocial problems (if relevant, see the NICE guideline on post-traumatic stress disorder)
- neurological and developmental problems, in liaison with community child development services.

1.13.2 For adults who have had bacterial meningitis or meningococcal disease, arrange for a review with a hospital doctor at 4 to 6 weeks after discharge from hospital. As part of this review, cover:

- the results of their audiological assessment (if available at this time), and whether cochlear implants are needed
- damage to bones and joints
- skin complications (including scarring from necrosis)
- psychosocial problems (if relevant, see the NICE guideline on post-traumatic stress disorder)
- neurological problems
- care needs.

1.13.3 For babies under 12 months who have had meningitis or meningococcal disease, arrange a review with a paediatrician for 1 year after discharge. At this review, assess for possible late-onset neurodevelopmental, orthopaedic, sensory and psychosocial complications.

Previous quality statement

NICE's quality standard on meningitis (bacterial) and meningococcal septicaemia in children and young people:

Statement 14: Children and young people who have had bacterial meningitis or meningococcal septicaemia have a follow-up appointment with a consultant paediatrician within 6 weeks of discharge.

Current UK practice

A survey of UK adults who had been diagnosed with meningitis in the past 5 years was carried out on behalf of Meningitis Now from September 2022 to February 2023. The survey received 228 responses, 58% of which were from people who had been diagnosed with bacterial meningitis. This noted that 52% of those adults who had bacterial meningitis were given a follow up appointment at a hospital, with 10% having a follow up appointment with their GP. 21% of people with bacterial meningitis arranged a follow up appointment themselves and 26% did not have follow up but stated they would have liked this.

Issues for consideration

For discussion:

- What is the priority for improvement? Stakeholders flagged rehabilitation including psychological support, audiological assessment and follow-up.
- Note: no recommendations on detection of compartment syndrome or psychological support for families were identified to support a quality statement.
- What is the key action that will lead to improvement?
- Could we focus on a specific population?
- Can we develop a specific, measurable statement? Note: previously there were 2 statements previously which included audiological assessment and paediatric follow-up within 6 weeks of discharge.

For decision:

- Should this area be prioritised for inclusion in the quality standard?

4.5 Information and support

Safety netting information

Stakeholders suggested that people who seek medical help for non-specific symptoms and signs are given 'safety netting' information that includes information on bacterial meningitis and meningococcal septicaemia. It was noted that most people that could have meningitis or meningococcal disease will be considered unlikely to have these conditions after a clinical assessment.

A stakeholder commented that safety netting information should clearly provide warning symptoms and when and how to access further healthcare. They felt it should be provided in a variety of ways, not just verbally, for example written or internet based.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.1.16 If you send a person home after clinical assessment for bacterial meningitis and meningococcal disease:

- give safety netting advice (see recommendation 1.3.2)
- ask them to return for further assessment if they develop new symptoms, if a rash changes from blanching to non-blanching, or if existing symptoms get worse.

1.3.2 For people who are unlikely to have bacterial meningitis or meningococcal disease, but who are sent home from hospital with an unconfirmed diagnosis:

- explain which symptoms and signs to look out for, and what changes should prompt them to return to hospital
- direct them to sources of online information.

Previous quality statement

NICE's quality standard on meningitis (bacterial) and meningococcal septicaemia in children and young people:

Statement 1: Parents and carers of children and young people presenting with non-specific symptoms and signs are given 'safety netting' information that includes information on bacterial meningitis and meningococcal septicaemia.

Current UK practice

No published studies on current practice were highlighted for this suggested area for quality improvement; this area is based on stakeholder's knowledge and experience.

Information and support after diagnosis

A stakeholder noted the importance of listening to and caring for families, including if they are worried or concerned. They also noted that whilst caring for parents and carers, their other children should be taken into account. They felt that support should link to any existing disabilities the child has, any new health conditions they have as a result of meningitis or meningococcal disease, or if the child dies.

A stakeholder commented that, particularly for adult patients, there is a lack of information provision regarding what to expect during recovery and where to access further support following a meningitis diagnosis.

A stakeholder commented that people with meningitis or meningococcal disease need information on the uncertainty about their initial prognosis and when they can expect to know more. They also need information on the potential short and long-term outcomes, taking account of the severity of their illness and their need for critical care.

Selected recommendations

NICE's guideline on bacterial meningitis and meningococcal disease (NG240):

1.11.1 Early in the management of confirmed bacterial meningitis or meningococcal disease, discuss the following with people and their family members or carers:

- what might happen during the course of the disease
- the uncertainty about their initial prognosis, and when they can expect to know more
- the risk of passing on the infection
- whether their close contacts need to take any preventative measures (for example, for meningococcal meningitis, meningococcal disease or Haemophilus influenzae type b)
- visible effects (such as drips and other invasive devices), swelling (for people receiving fluid resuscitation), and how rashes can spread and turn purple
- effects of sedative withdrawal, such as agitation or abnormal neurological behaviour

- the potential short and long-term outcomes, taking account of the severity of their illness and their need for critical care
- how to access support, including contact details of meningitis charities.

1.11.2 Repeat information over time and check the person understands, as they may be distressed and unable to ask questions when they are first diagnosed.

For more guidance on providing information, see the NICE guidelines on:

- patient experience in adult NHS services
- babies, children and young people's experience of healthcare.

1.11.3 Provide emotional and pastoral support for people and their family members and carers during hospitalisation.

Previous quality statement

NICE's quality standard on meningitis (bacterial) and meningococcal septicaemia in children and young people:

Statement 12: Children and young people who have had bacterial meningitis or meningococcal septicaemia, and/or their parents and carers, are given information before discharge about the disease, its potential long-term effects and how to access further support.

Current UK practice

A survey of UK adults who had been diagnosed with meningitis in the past 5 years was carried out on behalf of Meningitis Now from September 2022 to February 2023. The survey received 228 responses, 58% of which were from people who had been diagnosed with bacterial meningitis. 56% of people who had bacterial meningitis reported that they were not given any information to prepare for their return home but that they would have liked this. 14% said they had received enough information and 31% said they had received some, but not enough, information.

Issues for consideration

For discussion:

- What is the priority for improvement? Is it giving safety netting information or the provision of information on what to expect during recovery and potential outcomes?
- What is the key action that will lead to improvement?

- Can we develop a specific, measurable statement? Note: previously there were 2 statements on safety netting information and on information about potential long-term effects and accessing further support.

For decision:

- Should this area be prioritised for inclusion in the quality standard?

4.6 Additional areas

Summary of suggestions

The improvement areas below were suggested as part of the stakeholder engagement exercise. However, they were felt to be either unsuitable for development as quality statements, outside the remit of this particular quality standard referral or need further discussion by the committee to establish potential for statement development.

There will be an opportunity for the committee to discuss these areas at the end of the Advisory Committee meeting.

Table 2 Summary of information available for additional areas

Suggested area for improvement	Within remit of NICE QS	In scope	Guideline recs	Relevant existing QS
Impacts on global child health	No	No	No	No
Martha's rule	No	No	No	No
Vaccination	Yes	Yes	No	Yes
Reasonable adjustments and language and communication	Yes	yes	No	No
Amendments to NICE's guideline on fever in under 5s	No	No	No	No
Pathogen typing and investigation of clusters of infection	Yes	No	No	Yes

Impacts on global child health

A stakeholder highlighted their position statement on the impact of climate change on global child health and the actions they have taken regarding wars, especially the Middle East crisis.

These have been noted and have not been progressed for inclusion the quality standard. These areas are outside the remit of quality standards.

Martha's rule

A stakeholder highlighted there is learning to be taken from the work on Martha's rule.

This area has not been progressed for inclusion in the quality standard as this rule, giving parents and relatives the right to seek an urgent review if the person's

condition deteriorates, is mandatory and therefore not within the remit of quality standards.

Vaccination

A stakeholder queried the number of people who present with bacterial meningitis or meningococcal disease who have a complete vaccination record, noting the importance of improving rates of vaccination. Another noted that the previous version of the quality standard does not reference vaccination and prevention under the safety netting quality standard.

This area has not been progressed as vaccination is addressed in NICE's quality standard on vaccine uptake in under 19s.

Reasonable adjustments and language and communication

A stakeholder noted the importance of making reasonable adjustments. They also noted the importance of using simple, clear language, avoiding medical terms and 'jargon' wherever possible.

These suggestions have not been progressed as specific areas for inclusion in the quality standard. Equalities and health inequalities, including the need for reasonable adjustments and ensuring that communication is tailored to the people receiving the information, will be considered by the Quality Standards Advisory Committee and NICE throughout the development of the quality standard.

Amendments to NICE's guideline on fever in under 5s

A stakeholder suggested some amendments to the NICE guideline on fever in under 5s.

This has not been progressed as part of the development of this quality standard. The comments will be passed on to the guideline development team for consideration when the guideline is next reviewed.

Pathogen typing and investigation of clusters of infection

A stakeholder noted the importance of pathogen typing and investigation of clusters of infection.

This area has not been progressed. This comes under the scope of NICE's quality standard on infection prevention and control.

Appendix 1: Suggestions from registered stakeholders

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
Antibiotics prior to hospital admission and recognition of bacterial meningitis and meningococcal disease					
Antibiotics before arrival at hospital					
1	SCM3	Key area for quality improvement 1 'Pre-hospital antibiotic administration in bacterial meningitis or meningococcal disease' outside of hospital as soon as possible, and for meningococcal disease if there is likely to be a clinically significant delay in transfer to hospital	Little in the literature on this – reports from the efficacy and utility from certain areas https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7050377/	Ambulance services have electronic patient records and have an audit officer/team who could extract this data Approach to the Medical Directors of Ambulance services for this to be part of national audit/HQIP	(Sections 1.2.3 and 1.2.4 combined of the NICE guideline) For people with strongly suspected bacterial meningitis give intravenous or intramuscular ceftriaxone or benzylpenicillin
Recognising bacterial meningitis and meningococcal disease					
2	NHS England (LD team)	Key area for quality improvement 1 Discharge process	This standard relates to the period from getting into hospital to the right team to discharge. Are there barriers before that for families and children in relation to primary care or being listened to? There is also learning from the work on Martha's rule.		
3	Paediatric Critical Care Society	Key area for quality improvement 1	New National PEWS system for recognising unwell children endorsed by RCPCH, RCN and NHSE	Ensuring compliance with utilising new scoring system, including approaches to Martha's Rule using national data and audits	PCCS, GIRFT Future NHS SPOT
4	SCM1	Complete an assessment of signs and symptoms (including a full examination of children for a non-blanching rash) for	There is evidence that early bacterial meningitis and meningococcal disease are missed when patients first present	The patient record should include documentation that the skin was fully examined (including hidden	Recommendations 1.1.2 and 1.1.5 to 1.1.7 of the draft guideline update for CG102.

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
		meningitis and meningococcal disease.	to a healthcare professional. NICE guideline CG102 (draft update) specifically highlights the importance of examining for a non-blanching rash. Healthcare professionals may not completely undress children as part of their assessment, which may lead to important rashes being missed.	areas, such as the nappy band in small children).	
5	SCM2	Key area for quality improvement 2 Older adults presenting to emergency care pathways should be routinely screened and comprehensively assessed for causes of delirium using standardised measures and pathways.	The National GIRFT programme in 2021 identified variation in delirium recognition with many older patients who arrive through the emergency pathway not having an initial assessment. https://gettingitrightfirsttime.co.uk/wp-content/uploads/2021/09/Geriatric-Medicine-Sept21h.pdf The National Audit of Dementia identified variation in the approach hospitals take to carrying out and recording delirium assessment with 27% of patients with dementia receiving no confusion or cognitive tests at all. https://www.hqip.org.uk/wp-content/uploads/2018/08/NAD-Delirium-Spotlight-report-Aug-2018.pdf	The National Audit of Dementia has included delirium recognition among its key indicators: https://www.hqip.org.uk/wp-content/uploads/2018/08/NAD-Delirium-Spotlight-report-Aug-2018.pdf Delirium is now included in the NEWS2 scoring system which is now routinely collected within the Emergency Care Data Set (ECDS) along with the clinical Frailty Score (CFS) https://digital.nhs.uk/binaries/content/assets/website-assets/data-and-information/data-sets/ecds/ecds-user-guidance-v4.5.pdf	Delirium is common in meningitis and linked to poor outcomes https://journals.sagepub.com/doi/abs/10.1177/0885066620913004 Typical signs are not universally present in older adults with meningitis and meningococcal disease and the diagnosis may not be suspected in those presenting with delirium or other frailty syndromes. https://academic.oup.com/cid/article/33/8/1380/347483 There are valid tools to identify delirium in emergency care settings and effective interventions for delirium to optimise outcomes for older people https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5717753/ https://www.bgs.org.uk/resources/sign-157-risk-reduction-and-management-of-delirium The NEWS2 score now includes an indicator for delirium which is expected to significantly increase

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
					the number of alerts for delirium in acute settings. https://www.rcpjournals.org/content/clinmedicine/19/2/104
6	SCM2	Key area for quality improvement 1 Older adults presenting to emergency care acutely unwell should be rapidly and comprehensively assessed for the presence of serious underlying infections including bacterial meningitis and meningococcal disease by clinicians with expertise in assessment of acute frailty syndromes.	Older adults with frailty often do not present with typical symptoms of bacterial meningitis or sepsis which can easily be missed or mistaken for other problems leading to missed diagnosis and delayed treatment with poor outcomes including long lengths of hospital stay, increased need for new social care support or death. The National GIRFT programme in 2021 identified variation in frailty identification and assessment with many older patients who arrive through the emergency pathway not having an initial assessment. Where patients are not assessed, it's less likely there will be an effective early response because patients may be assessed by staff in A&E or other medical or surgical specialties where frailty assessment is not embedded in pathways and practice. https://gettingitrightfirsttime.co.uk/wp-content/uploads/2021/09/Geriatric-Medicine-Sept21h.pdf	NHS England CQUIN05 specifies rapid identification of frailty in emergency care settings followed by initiation of comprehensive geriatric assessment https://www.england.nhs.uk/wp-content/uploads/2022/12/Commissioning-for-Quality-and-Innovation-CQUIN-2023-24-guidance-version-1.2-1.pdf	There is considerable variability in clinical findings among older adults presenting with bacterial meningitis. Febrile responses are often blunted or absent and pyrexia is not a universal finding varying between 59% and100% in published studies. Similarly, headache and neck stiffness have been noted in only 50% of older adults with meningitis and may be misinterpreted due to co-morbidity such as cervical spondyloarthropathy. https://academic.oup.com/cid/article/33/8/1380/347483
Investigating suspected bacterial meningitis or meningococcal disease in hospital					
Lumbar puncture					

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
7	bioMerieux	Key area for quality improvement 1 Timely use of diagnostics	1. High number of cases without a confirmed microbiological diagnosis 2. It can take several days from doing a lumbar puncture to receiving results, despite availability of rapid PCR methods (due to several factors like sending a CSF sample to an offsite laboratory for example) 2. Direct impact to clinical management (*e.g* discontinuation of unnecessary antimicrobials) and potential reduction in hospital length of stay 3. Rapid pathogen identification will support appropriate steroids use	See following papers: - McGill *et al*., 2018 doi.org/10.1016/S1473-3099(18)30245-7 'Delays in getting a lumbar puncture and unnecessary treatment with antivirals were associated with longer hospital stays'. 'A substantial proportion of our patients had no cause identified' 'Rapid diagnostics and rationalising treatments might reduce the burden of meningitis on health services' - Ellis *et al*., 2022 doi.org/10.1136/bmjopen-2022-062698 'clinical care for patients with meningitis in the UK is not in line with current evidence-based national guidelines.' 'PCR was used, in our cohort, as a diagnostic modality in so few patients.' 'Meningitis-specific investigation order-sets using electronic ordering, and/or reflex laboratory testing to increase use of molecular diagnostics should be considered to reduce opportunities for missed microbiological diagnoses' 'Having rapid tests on site has been shown to reduce bed days with significant cost-savings'	In development NICE guideline [GID-NG10149] recommend use of PCR to identify causes of meningitis; time to results is however not acknowledged and a missed opportunity to improve care

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
				'Diagnostics and therapeutics should be targeted for quality improvement strategies'	
8	Meningitis Research Foundation	Key area for quality improvement 2 Timely diagnostics: LP to be undertaken within an hour for those with suspected bacterial meningitis and before starting antibiotics.	A retrospective cohort study looking at the clinical management of community acquired meningitis in UK adults[1] found that whilst 42% of blood cultures were taken within an hour of arrival at hospital, only 0.6% of LPs were administered within this timeframe. Neuroimaging prior to LP happened in 1094 of 1158 patients (94%), 911 (83%) of whom had no guideline-specified indication for this which significantly contributed to delays. In an assessment of healthcare delivery in the early management of bacterial meningitis in infants it was found that 59% of infants had an LP performed after the first dose of antibiotics, reducing the likelihood of accurately identifying the cause of the infection[2].	The retrospective cohort study based in UK hospitals collected this data using electronic case report forms on REDcap, a password protected central web based data base system	The current draft NICE guideline for Meningitis (bacterial) and meningococcal disease: recognition, diagnosis and management recommends performing an LP before starting antibiotics unless it will cause a clinically significant delay to starting the antibiotics and unless LP is contraindicated. The guidance recommends not performing routine neuroimaging before LP. Accurately identifying and isolating the pathogenic cause of the infection is becoming ever more important considering the increasing risk of multidrug resistant bacteria as a cause of meningitis and an aging population who are susceptible to a wider range of bacteria such as *E.coli* and *K.pneumoniae* which may require targeted antibiotic treatments. Likewise, if the infection can be identified as viral in nature early on antibiotics can be stopped earlier which allows for better antimicrobial stewardship.
9	NIHR Global Health Research Unit on Mucosal	Perform the lumbar puncture and blood culture before starting antibiotics, unless it will	A national audit of adult practice showed that only 0.6% of adults underwent a LP within 1 hour 42%	McGill et al. J Infect doi: 10.1016/j.jinf.2016.01.007; Ellis J, et al.	This is a recommendation in the NATIONAL INSTITUTE FOR HEALTH & CARE EXCELLENCE (NICE) Meningitis (bacterial) and

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
	Pathogens at UCL	cause a clinically significant delay to starting antibiotics	of patients underwent blood culture within 1 hour.	doi:10.1136/bmjopen-2022-062698 Van de Beek et al. DOI: 10.1016/j.cmi.2016.01.007	meningococcal disease: recognition, diagnosis and management guideline currently under review.
10	Society for Acute Medicine	Key area for quality improvement 2	Reducing delays to LP in suspected meningitis Due to overcrowding and the time taken for patients with ?meningitis to be seen by the medical team and then moved to a place ewhere an LP can be performed, there is often a huge delay. This then impacts on the ability to interpret the results (often after 36 hours of IV abx) so some patients end up having a complete course of 10 days IV treatment		
11	SCM 4	Timing of lumbar puncture in suspected meningitis (all ages).	Currently, many clinicians treat suspected meningitis without performing a lumbar puncture that can lead to incorrect or extended courses of antibiotics and increased length of stays in hospital. NICE draft Recommendation 1.4.1 states “blood tests **and lumbar puncture** are performed before starting antibiotics (if safe to perform and none of the features in recommendations 1.4.11 and 1.4.12 are present), and in line with the sections on blood tests and lumbar puncture”.	NICE guidelines	NICE draft Recommendation 1.4.1 states “blood tests **and lumbar puncture** are performed before starting antibiotics (if safe to perform and none of the features in recommendations 1.4.11 and 1.4.12 are present), and in line with the sections on blood tests and lumbar puncture”.
12	SCM 5	Key area for quality improvement 2 Timing of LP	Delays in LP reduce the likelihood of pathogen detection, resulting in increased exposure to	The NITCAR study used electronic case report forms from UK	NICE meningitis and meningococcal disease guideline, consultation draft

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			unnecessary antibiotics and prolonged hospital stays in cases that turn out to be viral in origin, and may increase mortality if the pathogen and antibiotic susceptibility cannot be determined. This is becoming more important as the proportion of meningitis cases due to viral causes has increased due to the introduction of successful vaccines against bacterial causes. Multidrug resistant causes are also on the rise. The NITCAR study that audited management of community acquired meningitis in 1471 adults in the UK and Ireland vs published national Joint Specialist Societies guidelines (*Ellis, J et al. "Clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017: a retrospective cohort study on behalf of the National Infection Trainees Collaborative for Audit and Research (NITCAR)." BMJ open 2022, doi:10.1136/bmjopen-2022-062698)* found that only 0.5% had a lumbar puncture within 1 hour, and just 26% within 8 hours. In infants under 3 months of age with meningitis, a study of healthcare delivery found that 59%	hospitals on REDcap to collect data In the study of healthcare delivery in infant meningitis, cases were identified from LabBase2, a national surveillance database used by National Health Service hospitals laboratories to voluntarily electronically report clinically significant infections to Public Health England (now UKHSA) In the study of healthcare delivery in infant meningitis, cases were identified from LabBase2, a national surveillance database used by National Health Service hospitals laboratories to voluntarily electronically report clinically significant infections to Public Health England (now UKHSA)	1.4 Investigating suspected bacterial meningitis in hospital 1.4.1 A senior clinical decision maker should perform an initial assessment and ensure that: … blood tests and lumbar puncture are performed before starting antibiotics … 1.4.9 Perform the lumbar puncture before starting antibiotics … unless it will cause a clinically significant delay to starting antibiotics. 1.4.10 Perform a lumbar puncture urgently for people with suspected bacterial meningitis

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			of infants had an LP after the first dose of antibiotics, and in 59% of these infants the LP was not done within 24 hours of starting antibiotics. *Okike I O et al. "Assessment of healthcare delivery in the early management of bacterial meningitis in UK young infants: an observational study." BMJ open 2017, doi:10.1136/bmjopen-2016-015700*		
CT scans					
13	Meningitis Research Foundation	Key area for quality improvement 2 Timely diagnostics: Neuroimaging to performed before LP **only if necessary** (for example, when there are focal neurological signs, abnormal pupillary reactions or a rapidly deteriorating level of consciousness)	A retrospective cohort study looking at the clinical management of community acquired meningitis in UK adults[1] found that whilst 42% of blood cultures were taken within an hour of arrival at hospital, only 0.6% of LPs were administered within this timeframe. Neuroimaging prior to LP happened in 1094 of 1158 patients (94%), 911 (83%) of whom had no guideline-specified indication for this which significantly contributed to delays.	The retrospective cohort study based in UK hospitals collected this data using electronic case report forms on REDcap, a password protected central web based data base system	The current draft NICE guideline for Meningitis (bacterial) and meningococcal disease: recognition, diagnosis and management recommends performing an LP before starting antibiotics unless it will cause a clinically significant delay to starting the antibiotics and unless LP is contraindicated. The guidance recommends not performing routine neuroimaging before LP.
14	NIHR Global Health Research Unit on Mucosal Pathogens at UCL	Neuroimaging should not be performed routinely before lumbar puncture	A national audit of adult practice showed that 83% of adults underwent unnecessary neuroimaging	McGill et al. J Infect doi: 10.1016/j.jinf.2016.01.007; Ellis J, et al. doi:10.1136/bmjopen-2022-062698 Van de Beek et al. DOI: 10.1016/j.cmi.2016.01.007	This is a recommendation in the NATIONAL INSTITUTE FOR HEALTH & CARE EXCELLENCE (NICE) Meningitis (bacterial) and meningococcal disease: recognition, diagnosis and management guideline currently under review.

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
15	Society for Acute Medicine	Key area for quality improvement 1	Reducing unnecessary CT scans in suspected meningitis Current guidance is that CT head is unnecessary unless certain red flags are present, However practical experience tells us as a society in most hospitals, nearly all patients get a CT scan		
16	SCM 4	Timing of neuroimaging if imaging is considered necessary in suspected meningitis (all ages)	Currently, too many clinicians order inappropriate brain imaging which causes delays prior to the investigation or treatment of suspected bacterial meningitis. NICE draft Recommendations 1.4.7 and 1.4.8 state 1.4.7 Do not routinely perform neuroimaging before lumbar puncture. 1.4.8 Consider neuroimaging before lumbar puncture if the person has any of the following features of brain herniation: •focal neurological features (including seizures or posturing) •abnormal pupillary reactions •a rapidly deteriorating level of consciousness.	NICE guidelines	NICE draft Recommendations 1.4.7 and 1.4.8 state 1.4.7 Do not routinely perform neuroimaging before lumbar puncture. 1.4.8 Consider neuroimaging before lumbar puncture if the person has any of the following features of brain herniation: •focal neurological features (including seizures or posturing) •abnormal pupillary reactions •a rapidly deteriorating level of consciousness.
17	SCM 5	Key area for quality improvement 2 reducing delays due to unnecessary neuroimaging	Delays in LP reduce the likelihood of pathogen detection, resulting in increased exposure to unnecessary antibiotics and prolonged hospital stays in cases that turn out to be viral in origin, and may increase mortality if the pathogen and antibiotic	The NITCAR study used electronic case report forms from UK hospitals on REDcap to collect data In the study of healthcare delivery in infant meningitis, cases were identified from LabBase2, a national surveillance database used by National Health Service	NICE meningitis and meningococcal disease guideline, consultation draft 1.4 Investigating suspected bacterial meningitis in hospital 1.4.7 Do not routinely perform neuroimaging before lumbar puncture. …

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			susceptibility cannot be determined. The NITCAR study that audited management of community acquired meningitis in 1471 adults in the UK and Ireland vs published national Joint Specialist Societies guidelines (*Ellis, J et al. "Clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017: a retrospective cohort study on behalf of the National Infection Trainees Collaborative for Audit and Research (NITCAR)." BMJ open 2022, doi:10.1136/bmjopen-2022-062698)* found that only 0.5% had a lumbar puncture within 1 hour, and just 26% within 8 hours. Neuroimaging before LP was done in 1094 of 1158 patients (94%), of whom 911 (83%) had no guideline-specified indication and this contributed to delays. *Okike I O et al. "Assessment of healthcare delivery in the early management of bacterial meningitis in UK young infants: an observational study." BMJ open 2017, doi:10.1136/bmjopen-2016-015700*	hospitals laboratories to voluntarily electronically report clinically significant infections to Public Health England (now UKHSA) In the study of healthcare delivery in infant meningitis, cases were identified from LabBase2, a national surveillance database used by National Health Service hospitals laboratories to voluntarily electronically report clinically significant infections to Public Health England (now UKHSA)	
Initial assessment and antibiotic treatment time in hospital					
18	Meningitis Research Foundation	Key area for quality improvement 1	A retrospective cohort study looking at the clinical management of community acquired meningitis	The retrospective cohort study based in UK hospitals collected this data using electronic case	The current draft NICE guideline for Meningitis (bacterial) and meningococcal disease:

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
		Timing of administering antibiotics to be within an hour for suspected bacterial meningitis or invasive meningococcal disease	in UK adults[1] found that less than 1 in 5 patients with possible bacterial meningitis had antibiotics administered within one hour of arrival at hospital and that the median door to antibiotic time was over 3 hours. In an assessment of healthcare delivery in the early management of bacterial meningitis in infants it was found that the median time from triage to first antibiotic dose was 2 hours [2] The treatment of bacterial meningitis is time critical and that delays lead to increased mortality.	report forms on REDcap, a password protected central web based data base system.	recognition, diagnosis and management recommend that antibiotics start within 1 hour of the person with suspected bacterial meningitis arriving at hospital. Meningitis Research Foundation have some concerns that the emphasis of the "red flag combination" of symptoms in the draft guidance about recognising bacterial meningitis and meningococcal disease may cause clinicians to wait for this combination to appear before acting, leading to delays in administering antibiotics. Recent research from Denmark which looked at prehospital symptoms of meningitis patients showed that most patients with bacterial meningitis (85%) reported at least 1 of the 3 symptoms in the classical triad of meningitis (fever, neck stiffness, and altered mental status), while only 3% reported all 3[3]. Auditing timing of antibiotics will be

[1] Ellis, Jayne et al. "Clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017: a retrospective cohort study on behalf of the National Infection Trainees Collaborative for Audit and Research (NITCAR)." BMJ open vol. 12,7 e062698. 13 Jul. 2022, doi:10.1136/bmjopen-2022-062698

[2] Okike, Ifeanyichukwu O et al. "Assessment of healthcare delivery in the early management of bacterial meningitis in UK young infants: an observational study." BMJ open vol. 7,8 e015700. 21 Aug. 2017, doi:10.1136/bmjopen-2016-015700

[3] Hovmand, N., Christensen, H.C., Lundbo, L.F. et al. Pre-hospital symptoms associated with acute bacterial meningitis differs between children and adults. Sci Rep 13, 21479 (2023). https://doi.org/10.1038/s41598-023-48161-x

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
					important to see if treatment delays due to lack of recognition are occurring.
19	NIHR Global Health Research Unit on Mucosal Pathogens at UCL	Administration of IV antibiotics within 1 hour	A national audit of adult practice showed that only 19% of adults met this standard	McGill et al. J Infect doi: 10.1016/j.jinf.2016.01.007; Ellis J, et al. doi:10.1136/bmjopen-2022-062698 Van de Beek et al. DOI: 10.1016/j.cmi.2016.01.007	This is a recommendation in the NATIONAL INSTITUTE FOR HEALTH & CARE EXCELLENCE (NICE) Meningitis (bacterial) and meningococcal disease: recognition, diagnosis and management guideline currently under review.
20	Royal College of Emergency Medicine	Key area for quality improvement 1 Time to initial assessment	Patients attending the hospital with symptoms or signs of meningitis, should have an initial rapid assessment/triage, to enable escalation to an appropriate clinician – i.e. senior clinical decision maker. During surges of activity, there can be unacceptable delays in the triage process for patients self-presenting to the ED, increasing the risk of unrecognised and untreated meningitis. During crowding, patients can be delayed in an ambulance before they are offloaded into the ED. This can introduce many hours delay before the patient has their first initial assessment in the ED.	ECDS – Emergency Care Data Set NHS England Ambulance performance indicators - https://www.england.nhs.uk/statistics/statistical-work-areas/ambulance-quality-indicators/ambulance-quality-indicators-data-2023-24/	NHS England guidance for initial assessment, advises assessment within 15 mins of arrival. NHS England guidance is that ambulances should be able to handover patients within 30 mins of arrival at the hospital.
21	Royal College of Emergency Medicine	Key area for quality improvement 2 To be seen by a senior decision maker within an hour	Once someone is identified as potentially having meningitis, they should be seen by a senior decision maker within one hour. The waits in crowded EDs are often unacceptably long. The	ECDS (Time to treating clinician)	NICE meningitis guidance 1.4.1 A senior clinical decision maker should perform an initial assessment and ensure that antibiotics are given within an hour

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			patient should be assessed prior to antibiotics and dexamethasone being prescribed.		
22	SCM 1	Early intravenous administration of appropriate antibiotics within one hour of arrival at hospital.	Antibiotics are the principal treatment for bacterial meningitis and meningococcal disease. There is evidence that early administration of appropriate antibiotics is reduces mortality.	Timings of hospital arrival, prescription, and administration of antibiotics should be clearly documented in the electronic patient record.	Sections 1.6 and 1.7 of the draft guideline update for CG102.
23	SCM 4	Timing of antibiotics for suspected meningitis and meningococcal disease in all ages	There are currently delays in the assessment and treatment of people with suspected meningitis and sepsis. This could be measured and audited NICE draft meningitis and meningococcal diseases guideline recommendation 1.4.1 states “antibiotics start within 1 hour of the person with suspected bacterial meningitis arriving at hospital, and in line with the section on antibiotics for bacterial meningitis in hospital” And recommendation 1.5.1 “antibiotics start within 1 hour of the person with suspected meningococcal disease arriving at hospital, and in line with the section on antibiotics for meningococcal disease in hospital”.	NICE guidelines	NICE draft guideline recommendation 1.4.1 states “antibiotics start within 1 hour of the person with suspected bacterial meningitis arriving at hospital, and in line with the section on antibiotics for bacterial meningitis in hospital” And recommendation 1.5.1 “antibiotics start within 1 hour of the person with suspected meningococcal disease arriving at hospital, and in line with the section on antibiotics for meningococcal disease in hospital”.
24	SCM 5	Key area for quality improvement 1 Timing of antibiotics: within 1 hour for suspected bacterial	Bacterial meningitis and meningococcal disease are medical emergencies, requiring urgent antibiotics.	The NITCAR study used electronic case report forms from UK hospitals on REDcap to collect data.	NICE meningitis and meningococcal disease guideline, consultation draft

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
		meningitis and for suspected meningococcal disease	The NITCAR study that audited management of community acquired meningitis in 1471 adults in the UK and Ireland vs published national Joint Specialist Societies guidelines (*Ellis, J et al. "Clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017: a retrospective cohort study on behalf of the National Infection Trainees Collaborative for Audit and Research (NITCAR)." BMJ open 2022, doi:10.1136/bmjopen-2022-062698)* found that approximately 1 in 5 patients with suspected meningitis received their antibiotics within 1 hour. The median time to antibiotics was 3.2 hours. This was identified in the study as a key area for improvement as it is known that delayed antibiotics increases mortality (*Proulx N, Fréchette D, Toye B, et al. Delays in the administration of antibiotics are associated with mortality from adult acute bacterial meningitis. QJM 2005;98:291–8.* *Bodilsen J, Dalager-Pedersen M, Schønheyder HC, et al. Time to antibiotic therapy and outcome in bacterial meningitis: a Danish population-based cohort study. BMC Infect Dis 2016;16:1–7.*	In the study of healthcare delivery in infant meningitis, cases were identified from LabBase2, a national surveillance database used by National Health Service hospitals laboratories to voluntarily electronically report clinically significant infections to Public Health England (now UKHSA)	1.4.1 A senior clinical decision maker should perform an initial assessment and ensure that: antibiotics start within 1 hour of the person with suspected bacterial meningitis arriving at hospital 1.5.1 A senior clinical decision maker should perform an initial assessment and ensure that: antibiotics start within 1 hour of the person with suspected meningococcal disease arriving at hospital

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			Auburtin M, Wolff M, Charpentier J, et al. Detrimental role of delayed antibiotic administration and penicillin-nonsusceptible strains in adult intensive care unit patients with pneumococcal meningitis: the PNEUMOREA prospective multicenter study. Crit Care Med 2006;34:2758–65.) In infants under 3 months of age with meningitis, a national study of healthcare delivery found that median time from triage to antibiotics was 2 hours *Okike I O et al. "Assessment of healthcare delivery in the early management of bacterial meningitis in UK young infants: an observational study." BMJ open 2017, doi:10.1136/bmjopen-2016-015700*		
Cerebrospinal fluid and blood samples					
25	Meningitis Research Foundation	Key area for quality improvement 3 Timely diagnostics: Perform timely and appropriate tests on CSF and blood samples including PCR for relevant pathogens	A retrospective cohort study looking at the clinical management of community acquired meningitis in UK adults[1] found that more than one-third of patients (n=553/1471) fulfilled the case definition of meningitis but had no confirmed microbiological diagnosis and were therefore categorised as meningitis of unknown aetiology. This high number of unidentified causes of meningitis was likely a result of delays in undertaking LP combined with low numbers of	The retrospective cohort study based in UK hospitals collected this data using electronic case report forms on REDcap, a password protected central web based data base system	This supports auditing recommendations 1.4.15 and 1.5.3 of the current draft NICE guideline for Meningitis (bacterial) and meningococcal disease: recognition, diagnosis and management in order to increase the proportion of cases where the causative pathogen is identified. Accurately identifying and isolating the pathogenic cause of the infection is becoming ever more important considering the increasing risk of multidrug

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			samples having the relevant PCR testing which can detect bacterial DNA for a longer periods after administration of antibiotics. Fewer than one-third of patients had pneumococcal (412, 28%) and meningococcal PCR (434, 29.5%) performed on their CSF in the study.		resistant bacteria as a cause of meningitis and an aging population who are susceptible to a wider range of bacteria such as *E.coli* and *K.pneumoniae* which may require targeted antibiotic treatments. Likewise, if the infection can be identified as viral in nature early on antibiotics can be stopped earlier which allows for better antimicrobial stewardship.
26	Society for Acute Medicine	Key area for quality improvement 3	Improving access to rapid PCR assays for CSF analysis This may improve the diagnostics especially if antibiotics already given – see above		
27	SCM 3	Key area for quality improvement 2 'Blood tests in bacterial meningitis or meningococcal disease'	Ellis J, Harvey D, Defres S on behalf of the National Audit of Meningitis Management (NAMM) group*, et al* Clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017: a retrospective cohort study on behalf of the National Infection Trainees Collaborative for Audit and Research (NITCAR) *BMJOpen* 2022;**12:**e062698. doi: 10.1136/bmjopen-2022-062698	Can this group be approached again? UKHSA for notified cases	(Sections 1.4.4 and 1.5.3 combined of the NICE guideline) Blood culture (before the first dose of antibiotics is given) White blood cell count (including neutrophils) Blood C-reactive protein (CRP), or procalcitonin (PCT) if CRP is not available Blood glucose (lactate for meningococcal disease) whole-blood diagnostic polymerase chain reaction (PCR
28	SCM 5	Key area for quality improvement 3 Performing timely and relevant testing, including PCR testing on CSF and blood	It's important to identify the pathogen in order to correctly target treatment, to increase patients' chances of making a good recovery, and decreasing exposure to unnecessary	The NITCAR study used electronic case report forms from UK hospitals on REDcap to collect data	NICE meningitis and meningococcal disease guideline, consultation draft **Blood tests**

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			antibiotics and prolonged hospital stays in cases that turn out to be viral in origin. This is becoming more important as the proportion of meningitis cases due to viral causes has increased due to the introduction of successful vaccines against bacterial causes. Multidrug resistant causes are also on the rise. Targeted PCR is crucial, as this can detect the pathogen from bacterial DNA for several days after CSF has been sterilised by administration of antibiotics. Increasingly, multiplex PCR is available for hospitals to use immediately on any cloudy CSF sample, resulting in diagnosis within about two hours. About half of meningococcal cases in the UK are diagnosed on blood PCR. The NITCAR study that audited management of community acquired meningitis in 1471 adults in the UK and Ireland vs published national Joint Specialist Societies guidelines (*Ellis, J et al. "Clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017: a retrospective cohort study on behalf of the National Infection Trainees Collaborative for Audit*		1.4.4 Perform the following blood tests for people with suspected bacterial meningitis: • blood culture (before the first dose of antibiotics is given) • white blood cell count (including neutrophils) • blood C-reactive protein (CRP), or procalcitonin (PCT) if CRP is not available • blood glucose • whole-blood diagnostic polymerase chain reaction (PCR). **Cerebrospinal fluid investigations** 1.4.15 Perform the following cerebrospinal fluid investigations in people with suspected bacterial meningitis: • white blood cell count and cell type (including differential white cell count) • total protein • glucose concentration (to calculate cerebrospinal fluid to blood glucose ratio) • microscopy for bacteria (using gram stain) • microbiological culture and sensitivities • PCR for relevant pathogens.

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			and Research (NITCAR)." BMJ open 2022, doi:10.1136/bmjopen-2022-062698) found that more than one-third of patients with meningitis had no confirmed microbiological diagnosis, due to delays in LP and failure to undertake relevant PCR testing which can detect bacterial DNA for period of time even after antibiotics have sterilised the CSF. Only 28% of patients had pneumococcal PCR and only 29.5% had meningococcal PCR of CSF. Just 14% of patients had pneumococcal PCR and just 16% had meningococcal PCR performed on blood samples. A prospective UK study of meningitis and encephalitis in children under 16 (*Martin, N et al, UK-ChiMes Study and Group, ENCEPH UK Study, Paediatric Meningitis in the Conjugate Vaccine Era and Development of a Novel Clinical Decision Model to Predict Bacterial Aetiology in 3,002 Children with Suspected Meningitis. http://dx.doi.org/10.2139/ssrn.4506566*) found that almost 50% of children did not have an aetiology of their meningitis identified.		
Treatment for bacterial meningitis or meningococcal disease in hospital					
Antibiotics					

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
29	NIHR Global Health Research Unit on Mucosal Pathogens at UCL	Give intravenous amoxicillin in addition to ceftriaxone or cefotaxime for people with risk factors for Listeria monocytogenes	A national audit of adult practice showed that 27% of adults fulfilling these criteria received listeria cover	McGill et al. J Infect doi: 10.1016/j.jinf.2016.01.007; Ellis J, et al. doi:10.1136/bmjopen-2022-062698 Van de Beek et al. DOI: 10.1016/j.cmi.2016.01.007	This is a recommendation in the NATIONAL INSTITUTE FOR HEALTH & CARE EXCELLENCE (NICE) Meningitis (bacterial) and meningococcal disease: recognition, diagnosis and management guideline currently under review.
30	SCM 3	Key area for quality improvement 3 Early and prompt initiation of treatment 'Before the causative organism is known, or when it cannot be identified in bacterial meningitis'	As above?		(Section 1.6.5 of the NICE guideline) Give ceftriaxone If ceftriaxone is contraindicated, consider cefotaxime (see the BNFC for contraindications to ceftriaxone for pre-term babies).
Cortisteroids					
31	NIHR Global Health Research Unit on Mucosal Pathogens at UCL	People with strongly suspected or confirmed bacterial meningitis should be given intravenous dexamethasone	A national audit of adult practice showed that 50% of adults fulfilling these criteria received dexamethasone	McGill et al. J Infect doi: 10.1016/j.jinf.2016.01.007; Ellis J, et al. doi:10.1136/bmjopen-2022-062698 Van de Beek et al. DOI: 10.1016/j.cmi.2016.01.007	This is a recommendation in the NATIONAL INSTITUTE FOR HEALTH & CARE EXCELLENCE (NICE) Meningitis (bacterial) and meningococcal disease: recognition, diagnosis and management guideline currently under review.
32	SCM 1	For people with strongly suspected or confirmed bacterial meningitis, give high-dose dexamethasone.	High-dose dexamethasone has been associated with reduced mortality and hearing impairment in adults as well as reduced hearing impairment in children and young people.	Timings of prescription and administration of dexamethasone should be clearly documented in the electronic patient record.	Recommendation 1.9.1 of the draft guideline update for CG102.
33	SCM 5	Key area for quality improvement 5	Steroids have been shown to reduce mortality and sequelae in bacterial meningitis, particularly pneumococcal meningitis in adults	The NITCAR study used electronic case report forms from UK hospitals on REDcap to collect data	NICE meningitis and meningococcal disease guideline, consultation draft

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
		In strongly suspected bacterial meningitis, give intravenous dexamethasone, starting with or before the first dose of antibiotics if possible or ASAP within 12 hours of antibiotics.	(mortality and sequelae) and Hib and pneumococcal meningitis (sequelae) in children. The NITCAR study that audited management of community acquired meningitis in 1471 adults in the UK and Ireland vs published national Joint Specialist Societies guidelines (*Ellis, J et al. "Clinical management of community-acquired meningitis in adults in the UK and Ireland in 2017: a retrospective cohort study on behalf of the National Infection Trainees Collaborative for Audit and Research (NITCAR)." BMJ open 2022,* doi:10.1136/bmjopen-2022-062698) found that 21% of patients had dexamethasone, and this was started with or before antibiotics in just 5% of patients. The study concluded that the low rate of steroid administration was an area that needed significant improvement		1.9.1 For people with strongly suspected or confirmed bacterial meningitis, give intravenous dexamethasone … • give the first dose with or before the first dose of antibiotics if possible • however, do not delay antibiotics to wait for dexamethasone to be started • if dexamethasone is delayed for less than 12 hours after the start of antibiotics, give dexamethasone as soon as possible • if dexamethasone is delayed for more than 12 hours after the start of antibiotics, get advice from an infection specialist and decide whether dexamethasone is still likely to provide benefit.
Discharge and follow up					
Preparing for hospital discharge					
34	Paediatric Critical Care Society	Key area for quality improvement 2	Ensuring early detection of compartment syndrome and need for rehabilitation including psychological support for patient and families	Audits	
35	SCM 4	Timing of hearing tests	Currently, timely hearing test assessment is not routinely done	NICE guidelines	Currently, timely hearing test assessment is not routinely done

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			in all patients (especially adults) who have had bacterial meningitis. Drat NICE guideline recommendations state "1.12.7 Offer a hearing assessment within 4 weeks of the person being well enough for testing (and preferably before discharge). 1.12.8 Offer children, young people and adults with severe or profound deafness an urgent assessment for cochlear implants as soon as they are well enough for testing."		in all patients (especially adults) who have had bacterial meningitis. Drat NICE guideline recommendations state "1.12.7 Offer a hearing assessment within 4 weeks of the person being well enough for testing (and preferably before discharge). 1.12.8 Offer children, young people and adults with severe or profound deafness an urgent assessment for cochlear implants as soon as they are well enough for testing."
Care after hospital discharge					
36	Meningitis Now	Key area for quality improvement 3 Follow-up after hospital discharge	Anecdotal evidence from those we support, along with evidence from a recent survey we have conducted, indicates that there is frequently a lack of any formal follow-up after discharge. This is particularly a problem for adult patients. Please see Meningitis Now/Picker survey report highlighting the lack of follow-up and aftercare for adult meningitis patients. https://issuu.com/meningitisnow/docs/picker_aftercare_report_a5_4pp_visual	• GP discharge letters Hospital discharge checklists	
37	Meningitis Research Foundation	Key area for quality improvement 4 Provide those who have had bacterial meningitis or meningococcal disease a	People who survive bacterial meningitis and meningococcal disease can be left with a wide range of impairments that may not always be apparent at discharge.		A survey of members of Meningitis Research Foundation with young children who had survived meningitis found that the inability of health professionals to predict

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
		review with a relevant clinician at 4 to 6 weeks after discharge from hospital. Provide babies under 12 months at the onset of illness with another review 1 year after discharge from hospital.	This new NICE guideline will provide recommendations for the follow up care of adult patients as well as children. Whilst paediatricians may be well accustomed to inviting children back for a review following disease, it is important for adults to also have a review. Likewise, for the first time it has been recommended that babies under 12 months of age at the time of illness are invited back for a review one year after the illness, because some impairments may not become apparent until the child reaches certain developmental milestones. It will be important to assess whether these new recommendations for supporting ongoing health needs of adults and babies who have had meningitis are being followed.		whether their young baby would have lasting effects was a source of worry and distress[4]. Parents expressed a desire for there to be more support in this area and the additional review at one year following the acute illness provides reassurance.
38	SCM 1	Outpatient review within 6 weeks of discharge from hospital.	There is evidence that patients with severe illness often feel forgotten once discharged from hospital. There are a number of sequalae that may need to be investigated and/or addressed after an admission for bacterial	Outpatient follow-up (if not the areas covered at that review) should be readily measurable using electronic booking systems and/or the patient record.	Recommendations 1.13.1 and 1.13.2 of the draft guideline update for CG102.

[4] Clark, Laura J et al. “The health, social and educational needs of children who have survived meningitis and septicaemia: the parents' perspective.” BMC public health vol. 13 954. 10 Oct. 2013, doi:10.1186/1471-2458-13-954

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			meningitis or meningococcal disease.		
39	SCM 3	Key area for quality improvement 5 'FOLLOW UP' For adults who have had bacterial meningitis or meningococcal disease, arrange for a review at 4 to 6 weeks after discharge from hospital, for children and young people, a review with a paediatrician in the same timescale. • Offer a hearing assessment within 4 weeks of the person being well 26 enough for testing (and preferably before discharge).	RCPCH notification system – BPSU is a possibility	RCPCH and RCP annual audit programs – indicate as QIP (could do HQIP) Could have feedback by registration data from UKHSA sources to confirm number of cases and response rates (imperfect as non- UK based travellers and separately, deaths, would form part of the denominator	(Sections 1.13.1/2 and 1.12.7 combined)
40	SCM 4	Timing of follow up	Currently, not everyone who has had meningitis is offered a follow up appointment. Draft NICE guidelines state "1.12.1Identify follow-up needs for people who have had bacterial meningitis or meningococcal disease, taking into account potential cognitive, developmental, orthopaedic, skin, sensory, psychosocial, education, and renal complications." With further advice re specific problems in 1.12.2 through 1.12.8.	NICE guidelines	Draft NICE guidelines state "1.12.1Identify follow-up needs for people who have had bacterial meningitis or meningococcal disease, taking into account potential cognitive, developmental, orthopaedic, skin, sensory, psychosocial, education, and renal complications." With further advice re specific problems in 1.12.2 through 1.12.8.

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
41	SCM 5	Key area for quality improvement 4 People who have had bacterial meningitis or meningococcal disease should have a follow up appointment 4 to 6 weeks after discharge, which should include the results of a hearing test. Babies under 12 months of age should have an additional follow up appointment 1 year after discharge.	People who recover from meningitis and meningococcal disease may have a wide spectrum of cognitive, neurological/developmental, orthopaedic, skin, sensory, psychosocial, education, and renal problems due to their illness, not all of which will be apparent at discharge. Providing a post-discharge review for everyone can help ensure referral to appropriate services for everyone who needs them. In the case of cochlear implantation for those with severe to profound deafness, this is time-critical. Follow up for adults after meningitis and meningococcal disease is specified for the first time in the new NICE meningitis and meningococcal disease guideline. Additional follow up after 1 year is specified for babies younger than 12 months of age for the first time also. This is important, as it is often impossible to identify developmental/neurological problems in very young babies just 6 weeks after discharge.		NICE meningitis and meningococcal disease guideline, consultation draft 1.13 **Care after hospital discharge** 1.13.1 For babies, children and young people who have had bacterial meningitis or meningococcal disease, arrange for a review with a paediatrician at 4 to 6 weeks after discharge from hospital. As part of this review, cover: • the results of their hearing test, and whether cochlear implants are needed • damage to bones and joints • skin complications (including scarring from necrosis) • psychosocial problems (if relevant, see the NICE guideline on post-traumatic stress disorder) • neurological and developmental problems, in liaison with community child development services. 1.13.2 For adults who have had bacterial meningitis or meningococcal disease, arrange for a review at 4 to 6 weeks after discharge from hospital. As part of this review, cover…the same points as above (except neurodevelopmental problems which are not relevant in adults)

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
					1.13.3 For babies under 12 months who have had meningitis or meningococcal disease, arrange a review for 1 year after discharge. At this review, assess for possible late-onset neurodevelopmental, orthopaedic, sensory and psychosocial complications.
Information and support					
Safety netting information					
42	Meningitis Now	Key area for quality improvement 1 Safety Netting	Anecdotal evidence from those we support suggests that many individuals/parents/carers are not given always provided with clear safety netting information. Nor do they feel that their concerns are listened too. Safety netting information should clearly provide warning symptoms, when and how to access further healthcare. This information should be provided in a variety of ways, not just verbally e.g. written or internet based.	We note that this is a quality standard for the previous NICE guideline CG102 : https://cks.nice.org.uk/topics/meningitis-bacterial-meningitis-meningococcal-disease/goals-outcome-measures/nice-quality-standards/ We feel strongly that this should be updated to include adults and be included in the new quality standard for meningitis (bacterial) and meningococcal disease: recognition, diagnosis and management (currently in development).	
43	Meningitis Research Foundation	Key area for quality improvement 5 People who seek medical help for non-specific symptoms and signs are given 'safety netting' information that includes information on bacterial meningitis and meningococcal septicaemia.	Because bacterial meningitis and meningococcal disease are difficult to diagnose or distinguish from other conditions and can be rapidly fatal, it is important to provide safety netting information to patients. One study found that around half (49%) of children who had		Following some high-profile deaths from meningococcal disease, an expert Meningococcal Working Group was established in 2018 at the request of the Secretary of State for Health and Social Care with a view to improved assurance of early diagnosis of meningitis. The group

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			invasive meningococcal disease were sent home after their first visit to a GP or health professional and not admitted to hospital[5]. Another study in very young infants showed that 30% of parents of very young infants with bacterial meningitis took the child straight to the hospital: 70% sought help by phoning the GP, calling the 24-hour NHS telephone service or contacting the community midwife, and 28% were advised to stay at home[2].		recommended that patients and carers should be empowered with appropriate knowledge so they can seek further advice and assessment if concerned. The recommendation stated that it should be recorded in the patient's notes that this information has been provided, and there should be mechanisms in place to monitor and audit that this is taking place. They suggested, as an example, that the Care Quality Commission could consider this metric during inspections of acute trusts and primary care[6] GP's are often the first point of call for parents with a sick child. However, without safety-netting advice being given if a child is sent home, multiple appointments or contacts can be made for a relatively well child. Safety netting advice reduces re-attendances and parents want and need explicit and consistent advice for

[5] . Thompson MJ, Ninis N, Perera R, Mayon-White R, Phillips C, Bailey L, Harnden A, Mant D, Levin M. Clinical recognition of meningococcal disease in children and adolescents. Lancet. 2006 Feb 4; 367(9508):397-403

[6] Meningococcal Working Group report. Raising awareness of the signs and symptoms, and ensuring early diagnosis and treatment of meningococcal disease. Report to the Secretary of State for Health & Social Care Department of Health and Social Care. April 2018

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
					appropriate home management of their unwell child[7,8]. Additionally, the provision of safety netting information may improve antimicrobial stewardship[9]. A survey of healthcare educators identified a perception amongst clinicians that parents want antibiotics for their child but in reality parents may be satisfied with information about how to manage symptoms and how to identify signs of deterioration. The provision of safety netting information is based on recommendations from the NICE guidelines on: • Meningitis (bacterial) and meningococcal disease • Fever in under 5s: assessment and initial management Neonatal infection: antibiotics for prevention and treatment
44	SCM 1	Documented safety netting plan specifying the changes that should prompt them to return to hospital.	Most people that could have meningitis or meningococcal disease will be considered unlikely to have these conditions after a	The patient record should document specific safety netting advice, i.e. features, timeframes, and actions.	Recommendation 1.3.2 of the draft guideline update for CG102.

[7] Maguire S, Ranmal R, Komulainen S, Pearse S, Maconochie I, Lakhanpaul M, Davies F, Kai J, Stephenson T. On behalf of the RCPCH Fever Project Board (2011) Which urgent care services do febrile children use and why? Archives of Disease in Childhood 2011

[8] . Royal College of Paediatrics and Child Health et al.To understand and improve the experience of parents and carers who need advice when a child has a fever (high temperature). RESEARCH REPORT March 2010.

[9] NHS Health Education Education England (2018). Tackling antimicrobial resistance: educational priorities. Available from https://hee.nhs.uk/sites/default/files/documents/Tackling%20antimicrobial%20resistance%20-%20educational%20priorities%20report.pdf Accessed Dec 2023

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			clinical assessment. They will therefore be discharged with safety netting advice. The effectiveness of that advice will likely depend on what they are told and how the information is provided.		
Information and support after diagnosis					
45	Meningitis Now	Key area for quality improvement 2 Information provision	Anecdotal evidence from those we support, along with evidence from a recent survey we have conducted, indicates that there is frequently a lack of information provision regarding what to expect during recovery and where to access further support following a meningitis diagnosis. This is particularly a problem for adult patients. Please see Meningitis Now/Picker survey report highlighting the lack of follow-up and aftercare for adult meningitis patients. https://issuu.com/meningitisnow/docs/picker_aftercare_report_a5_4pp_visual	• GP discharge letters Hospital discharge checklists	
46	NHS England (LD team)	Key area for quality improvement 2 Listening to Carers	There need to be more about listening to and caring for families as there is very little in the current standards including if they are worried or concerned (link to Martha's rule but also to Ask Listen Do). Also caring for them as parent carers, families who may also have other children and		

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			carers Overview | Supporting adult carers | Guidance | NICE		
47	NHS England (LD team)	Key area for quality improvement 3 CYP Voice and Patient Experience	Link to NICE CYP voice and experience standard Overview | Babies, children and young people's experience of healthcare | Guidance | NICE Link to what if the child has other disabilities already (staff training etc), has new health conditions as a result of these conditions (families would need more than a leaflet about this) or does not make it. Bereavement remains with families for some time and with father and mothers especially forever. The guidance currently seems quite linear, matter of fact and cold in these respects.		
48	SCM 3	Key area for quality improvement 4 'Information and support after diagnosis' What might happen during the course of the disease	https://www.meningitis.org/	Parental/patient involvement with feedback returns – could automate via SMS text via GP	(Section 1.11 of the NICE guideline) The uncertainty about their initial prognosis, and when they can expect to know more The potential short and long-term outcomes, taking account of the severity of their illness and their need for critical care
Additional areas					
49	RCPCH	Key area for quality improvement 1: The impact of climate change on global child health – position statement.	The Royal College of Paediatrics and Child Health recognises that climate change is an existential threat to the health and wellbeing of children and young people. In October 2020	Please see The position statement of The Royal College of Paediatrics that summarises the recommendations and activity about mitigation and adaptation against the impact of climate change on children and young	

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
				people around the world. Last modified 28 September 2023 (Vector borne and infectious disease)	
50	RCPCH	Key area for quality improvement 2: The wars especially Middle East Crisis	Following the escalating crisis in the Middle East, RCPCH has put together this page to signpost to key resources. Last modified9 November 2023 Post date9 November 2023. The Royal College of Paediatrics and Child Health (RCPCH) advocates for the best interests of children. We aim to do so without engaging in political commentary or judgement. RCPCH action Statement responding to the deteriorating situation in the region: Following initial reports of escalating violence, we put together a statement on 20 October 2023. Political action: We have written to the Foreign and Commonwealth Development Secretary of State, James Cleverly, calling on the UK to use their diplomatic channels to call for the prioritisation and protection of children and young people whoever they are and wherever they may be in this conflict. Statements from other paediatric organisations Across the world, paediatric organisations are raising their		

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			concerns about the .Middle East crisis, including: European Confederation of Primary Care Paediatricians (ECPCP) International Pediatric Association (IPA) International Child Health Group (ICHG)		
51	Paediatric Critical Care Society	Key area for quality improvement 3	Ensuring paediatric patient representation on working group	Equality for all age groups	
52	NHS England (LD team)	Key area for quality improvement 1 Discharge process	There is also learning from the work on Martha's rule.	Martha's rule: What could the proposed changes mean for doctors? | The BMJ	
53	NHS England (OCSO)	5) On the specialist list of members for future reviews scientists/pharmacists could be added with experience in prescription/clinical diagnostics for meningitis and quality management of clinical laboratory processes and IPC nurses			
54	NHS England (IP&C team)	Key area for quality improvement 1 Vaccination : what numbers who present with suspected / actual Meningitis (bacterial) and meningococcal disease have a complete vaccination record	Improve rates of vaccination uptake: significant decline in adolescents presenting and incomplete courses across all age groups	https://www.gov.uk/government/news/around-1-in-8-new-students-unprotected-against-meningitis https://www.who.int/news-room/fact-sheets/detail/meningitis https://www.gov.uk/government/publications/meningococcal-disease-laboratory-confirmed-cases-in-england-in-2021-to-2022/invasive-meningococcal-disease-in-	

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
				england-annual-laboratory-confirmed-reports-for-epidemiological-year-2021-to-2022	
55	NHS England (OCSO)	1) Quality statement 1 Safey netting - The standard does not make reference to vaccination and prevention of meningitis under information for the public for non-spec symptoms			
56	NHS England (LD team)	Key area for quality improvement 4 Reasonable Adjustments	We strongly suggest the document makes reference to making reasonable adjustments. This is a legal requirement as stated in the Equality Act 2010. Adjustments aim to remove barriers, do things in a different way, or to provide something additional to enable a person to receive the assessment and treatment they need. Possible examples include; allocating a clinician by gender, taking blood samples by thumb prick rather than needle, providing a quiet space to see the patient away from excess noise and activity. We recommend including reference to the Reasonable Adjustment Digital Flag (RADF) and the RADF Information Standard which mandates all providers and commissioners of health services and publicly funded social care to identify, record, flag, share, meet and	DAPB4019: Reasonable Adjustment Digital Flag - NHS Digital	

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
			review Reasonable Adjustments, including details of their underlying conditions		
57	NHS England (LD team)	Key area for quality improvement 5 Language and Communication	We recommend including reference to the importance of Communication: Using simple, clear language, avoiding medical terms and 'jargon' wherever possible. Some people may be non-verbal and unable to describe verbally how they feel. Pictures may be a useful way of communicating with some people, but not all. Please note recent LeDeR research: kcl.ac.uk/ioppn/assets/fans-dept/leder-main-report-hyperlinked.pdf		
58	NHS England (PCC team)	Key area for quality improvement 1 Fever Under 5 Adding in Myocarditis as a specific illness (Section 1.2.17)	In recent years there has been more presentations of enterovirus and human parechovirus myocarditis as well as other causes. In many instances these cases are diagnostically delayed as this differential is often not considered. The management also differs to many other forms of sepsis and there is now guidance on the recognition and management of enterovirus myocarditis for example.	BPSU guidance and RCPCH guidance BPSU study - Severe complications of enterovirus or human parechovirus infection | RCPCH	
59	NHS England (PCC team)	Key area for quality improvement 2	Paediatric imported infections are rising and there has been an	RCPCH toolkit for MPOX is useful.	

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
		Fever Under 5 Imported Infections 1.2.28 Adding more specific guidance on considering HCID and supporting clinicians to the right resource for isolation, PPE, containment to protect staff and other patients	increased incidence of paediatric high consequence infectious diseases (HCID) including Mpox and neonatal Lassa. The management includes isolation, PPE, contacting regional paediatric ID specialists in order to escalate appropriate and safe testing, containment and contact tracing. Slightly different to usual paediatric sepsis.	Mpox (monkeypox) outbreak 2022 - guidance | RCPCH	
60	NHS England (OCSO)	2) Quality statement 3 This includes giving antibiotics but makes not mention to resistance, stewardship or ongoing management			
61	NHS England (OCSO)	3) Quality statements other than meningococcal cause - For children less than 3 months other causes (eg.,GBS) or atypical causes and treatment are not detailed – consideration to include GBS could be made for early onset GBS/Late onset GBS infection			
62	NHS England (OCSO)	4) Quality statement - Pathogen typing/identification of clusters of infection/sepsis are not noted – which can occur in healthcare settings			
No comments					
63	Royal College of Nursing		Thank you for the opportunity to contribute to the above consultation, we received no member comments this time.		

ID	Stakeholder	Key area for quality improvement	Why is this a key area for quality improvement?	Data Sources	Supporting information
64	British Society for Antimicrobial Chemotherapy		Thank you for your invitation to comment on this topic engagement. Members of The British Society for Antimicrobial Chemotherapy (BSAC) have no comments to make on this occasion.		
65	Royal College of Physicians		This has been circulated to our experts and reminders sent but unfortunately have not had any feedback so will not be responding on this occasion.		