UK Health Security Agency

Guidance for public health management of meningococcal disease in the UK

Updated November 2024

Contents

Document history

Date	Change details
August 2019	The definition of a ‘probable’ IMD case has been clarified. Confirmation that the recent EU review of fluoroquinolones does not affect guidance on ciprofloxacin chemoprophylaxis for meningococcal disease. Definition of a cluster has been clarified. The importance of investigating for underlying risk factors in IMD patients due to unusual meningococcal serogroups, non-groupable strains or recurrent meningococcal disease has been highlighted and Appendix 5 added for communication with GPs concerning this.
September 2024	Document transferred from PHE to UKHSA branding. Updated epidemiology section. Consideration for Rifampicin prophylaxis following cases arising after travel to the Middle East and Asia, section added. Updated laboratory investigations and national surveillance sections. Contact details for all nations updated where appropriate. Aligning recommendations with NICE guidance (NG240, 19 March 2024). Isolation of meningococci from non-sterile sites – specifically covering urogenital and anorectal infections. Close contact definitions, including shisha sharing. Updated considerations for outbreak scenarios and recommended MenB outbreak vaccine schedules. Guidance on vaccination in pregnancy.
October 2024	Consideration of shisha sharing updated.
November 2024	Updated ciprofloxacin section under ‘8.3 Choice of agent for chemoprophylaxis’.

1. Background

Neisseria meningitidis is a major cause of septicaemia and meningitis worldwide and is associated with significant mortality as well as serious long-term sequelae among survivors (1). Six meningococcal capsular groups (A, B, C, W, X and Y) distinguished by their polysaccharide capsule cause almost all invasive infections in humans. Epidemiology differs by serogroup and clonal complex combination. The meningococcus commonly colonises the nasopharynx and carriage prevalence increases through childhood and peaks at 18 to 20 years before declining (2, 3). Carriage episodes may last for many months (4). Invasive disease is a rare outcome of acquisition but onward transmission from cases to close contacts can rarely result in secondary cases, as well as clusters of infection (5, 6, 7). Fewer than 2% of invasive meningococcal disease (IMD) cases, however, are considered to result from close contact with a primary IMD case (8). In 2014, prior to the introduction of routine MenB infant and MenACWY teenage vaccination, annual IMD incidence across all age groups was approximately 1.2 per 100,000 in the UK (9).

Systemic immunity, as measured by serum bactericidal antibodies, usually develops within 14 days of acquisition of meningococci (10). Rarely, acquisition may progress to invasive disease before immunity develops. This incubation period is usually 3 to 5 days, based on data from studies of laboratory-acquired infection (11), from occasional clusters where the date of exposure is known (12) and from carriage studies among military recruits (13). Established meningococcal carriers do not usually develop invasive disease (13).The risk of invasive disease following acquisition is likely to vary with environmental and host factors, but will also depend critically on the characteristics of the strain acquired. Only a very small proportion of carried strains are responsible for invasive disease (14).

Conjugate vaccines against group C meningococci (MenC) have been available since the late 1990s and quadrivalent conjugate vaccines against groups A, C, W and Y (MenACWY) have been licensed in Europe for almost 2 decades. In early 2013, a new vaccine developed specifically to prevent disease caused by group B meningococci (MenB), was licensed in Europe (4CMenB, Bexsero®, GSK Biologicals, Belgium). This vaccine was unlike the pre-existing MenC and MenACWY conjugate vaccines in that it is protein-based and, therefore, has a different mechanism of action compared with conjugate vaccines along with different safety, reactogenicity and immunogenicity profiles in different age groups (15). In 2017, another MenB vaccine, using bi-valent lipidated fHbp (rLP2086, Trumenba®; Pfizer), was licensed in Europe. rLP2086 (Trumenba®) is currently licensed for individuals aged 10 years and older. This guidance includes the potential use of MenB vaccine in the public health management of cases and contacts of IMD.

1.1 Objectives of guidelines

This guidance covers pre-admission management, investigation of suspected cases, case definitions, chemoprophylaxis and vaccination of cases and close contacts of sporadic cases, as well as management of IMD clusters and outbreaks.

This 2024 UK guidance update has been reviewed by the UK Health Security Agency (UKHSA) Vaccine Preventable Invasive Bacterial Infections (VaPIBI) Forum. Previous updates were made in 2019, while the 2018 update replaced the 2012 Guidance for public health management of meningococcal disease in the UK and the 2014 guidance on preventing secondary cases of MenB disease. The current update includes more recent data on disease epidemiology, together with updated advice on vaccination of cases and close contacts, including public health action after infections of the genitourinary tract.

2. Epidemiology of IMD in the UK

2.1 General epidemiology

In late 2019, the world saw the emergence of a novel coronavirus SARS-CoV-2, which led to the declaration of a pandemic with the implementation of non-pharmaceutical interventions such as lock down and social distancing in most countries, including the UK, in 2020 and 2021. During that time, the number of laboratory-confirmed IMD cases decreased substantially across all age groups and for all serogroups (16). Following the easing of local and national restrictions after July 2021, there was a notable increase in serogroup B IMD cases, with numbers in adolescents and young adults comparable to those observed pre-pandemic. IMD cases in other age groups and from other serogroups remained very low throughout 2021 to 2022. MenB cases began to increase in all age groups in 2022 to 2023 whereas non-MenB disease has remained very low.

2.2 Meningococcal group C

The MenC conjugate vaccine was implemented into the UK national immunisation programme in 1999 and was highly effective in preventing MenC IMD across all age groups through direct and indirect (herd) protection (17). MenC is currently well-controlled, with only 30 to 40 cases annually prior to the pandemic (17, 18). Current cases are mainly diagnosed in adults born outside the UK who were unvaccinated against MenC disease and small numbers of cases arising in previously-vaccinated children.

2.3 Meningococcal group W

MenW cases increased with the emergence and rapid expansion of a hyperinvasive strain belonging to the ST-11 complex (19, 20) in 2010 and is now controlled following implementation of an emergency MenACWY immunisation programme for teenagers in August 2015. MenACWY vaccination is now routinely offered at 13 to 14 years and MenW IMD cases are currently very low across all age groups (21).

2.4 Meningococcal group Y

MenY disease remains uncommon in the UK and predominantly affects older adults and those with underlying health conditions. MenY IMD cases declined further across all age groups following implementation of an emergency MenACWY immunisation programme for teenagers in August 2015 and remain low with the routine teenage MenACWY vaccine programme (21).

2.5 Meningococcal group B

MenB IMD cases fell between 2001 to 2002 and 2013 to 2014, likely because of secular trends (22). MenB accounted for nearly 90% of cases during 2006 to 2011, with an overall incidence of nearly 2 per 100,000. The implementation of 4CMenB (Bexsero®) into the national infant immunisation programme since September 2015 resulted in a large and significant reduction in MenB IMD cases in vaccinated children (23, 24). MenB IMD cases have predominated with the early re-emergence of disease since restrictions to control the COVID-19 pandemic were withdrawn in July 2021 (25).

2.6 Other meningococcal groups

Other meningococcal groups rarely cause invasive disease in the UK, with most cases occurring in those with underlying health conditions. In other parts of the world different serogroups may predominate. Large epidemics of both capsular group A and W meningococcal infection have occurred in association with Hajj pilgrimages, and proof of vaccination against A, C, W and Y capsular groups is now a visa entry requirement for pilgrims and seasonal workers travelling to the Kingdom of Saudi Arabia. Epidemics arise unpredictably throughout sub-saharan Africa with MenA previously predominating before the successful introduction of MenA conjugate vaccine (26). Subsequent outbreaks have been due to serogroups C, W and X.

3. Vaccination programmes

3.1 MenC conjugate vaccines

MenC vaccine (Meningitec®, Menjugate® or NeisVac®) was included in the routine infant programme from November 1999 but is no longer part of the national immunisation programme (27, 18, 28). Currently, protection against MenC includes a single Hib/MenC combination vaccine (Menitorix®) at one year of age, but this vaccine will no longer be available in 2025.

3.2 Quadrivalent MenACWY vaccines

A MenACWY conjugate vaccine (Menveo®, Nimenrix®, MenQuadfi®) is offered at 13 to 14 years of age and those who missed vaccination remain eligible up to their 25th birthday. This includes those who missed the school's programme and those attending University for the 1st time, including students arriving in the UK from countries that may not have offered this vaccination. MenACWY conjugate vaccines confer no protection against MenB.

3.3 MenB vaccine

4CMenB (Bexsero®; GSK) was licensed in Europe in early 2013 and is a protein based vaccine containing 4 main components: factor H binding protein (fHbp) variant 1.1, Neisserial Adhesin A (NadA), Neisseria Heparin Binding Antigen (NHBA) and the New Zealand Outer Membrane Vesicle (OMV) vaccine (MenZB) which incorporates Porin A (PorA) P1.4 (15).

4CMenB (Bexsero®) was implemented in the infant programme on 1 September 2015. Infants born in May 2015 were eligible for the vaccine at 16 weeks and 1 year, those born in June were eligible for the vaccine at 12 weeks, 16 weeks and 1 year, and those born since 1 July 2015 are offered the vaccine at at 8 weeks, 16 weeks and 1 year of age. 4CMenB (Bexsero®) has been highly effective in preventing MenB IMD in vaccinated children (24, 23, 29). 4CMenB (Bexsero®) may also protect against other meningococcal serogroups that possess cross-reactive vaccine antigens on their cell surface (30). A number of observational studies have also reported some cross-protection from 4CMenB (Bexsero®) against gonorrhoea, which is cause by the genetically related Neisseria gonorrhoeae (31).

In 2017, another MenB vaccine, using bi-valent lipidated fHbp (rLP2086; Trumenba®; Pfizer), was licensed in Europe. rLP2086 (Trumenba®) is licensed for individuals aged 10 years and older, but has been found to be immunogenic in children as young as one year of age (32) and without any significant safety or reactogenicity concerns:

- in a study of 220 toddlers aged 1 to less than 2 years of age, the following adverse reactions occurred at a frequency of very common (greater than or equal to 1 out of

10): drowsiness, irritability (fussiness), loss of or decreased appetite, fever, and injection site pain, swelling and redness

- in a study of 294 children 2 to 9 years of age, the following adverse reactions occurred at a frequency of very common (greater than or equal to 1 out of 10): headache, diarrhoea, vomiting, muscle pain, joint pain, fever, fatigue, and injection site pain, swelling and redness
- in clinical studies, fever (greater than or equal to 38°C) occurred more frequently as subject age decreased. Of subjects 1 to less than 2 years of age, 37.3% reported fever; of subjects 2 to 9 years of age, 24.5% reported fever; of subjects 10 to 18 years of age, 9.8% reported fever; and of subjects 18 to 25 years of age, 4.4% reported fever. Fever followed a predictable pattern after vaccination: onset occurred within 2 to 4 days, lasted 1 day, and was mild to moderate in severity. Fever rate and severity tended to decrease with subsequent rLP2086 (Trumenba®) vaccinations
- adverse reactions following a booster vaccination in 147 subjects 3 to 5 years of age were similar to adverse reactions during the primary rLP2086 (Trumenba®) vaccination series approximately 2 years earlier

rLP2086 (Trumenba®) is licensed to be given as 2 doses (0.5 ml each) administered at a 6-month interval or as 3 doses (2 doses at least 1 month apart with a third dose at least 4 months later). rLP2086 (Trumenba®) has yet to be implemented in a national immunisation schedule.

Importantly, both 4CMenB (Bexsero®) and rLP2086 (Trumenba®) target sub-capsular, surface exposed antigens (rather than the polysaccharide capsule targetted by polysaccharide-conjugate vaccines like MenC and MenACWY vaccines). They have been developed to protect against as many common MenB strains as possible but they do not protect against all MenB strains. Continued awareness and vigilance is, therefore, essential even after completion of vaccine schedules.

4. Additional guidance

National Institute for Health and Care Excellence (NICE) published updated guidance covering Meningitis (bacterial) and meningococcal disease: recognition, diagnosis and management (33).

UK guidance for universities and other higher education institutions (HEIs) is also available (34).

Refer to the Sign Grading System 1999 to 2012 by the Scottish Intercollegiate Guidelines Network (SIGN) (35) for Table 1 and Table 2 for levels of evidence and gradings of recommendations (see Appendix 1).

5. Pre-admission management recommendations

Updated NICE guidance was published in March 2024 and should be referred to, the following specific recommendations were made (33).

1. Transfer people with suspected bacterial meningitis or meningococcal disease to hospital as an emergency.
2. Tell the hospital that a person with suspected bacterial meningitis or meningococcal disease is being transferred and that they will need assessment by a senior clinical decision maker.
3. Do not delay transfer to hospital to give antibiotics to people with suspected or strongly suspected bacterial meningitis or meningococcal disease.
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.
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.
6. Do not give antibiotics outside of hospital if the person has severe antibiotic allergy to either ceftriaxone or benzylpenicillin.

Recommendation 1: Pre-admission management (British National Formulary)

Rapid admission to hospital is the highest priority when IMD is suspected.

Evidence grade C

Immediate single dose of IV/IM Ceftriaxone for suspected meningococcal infections. Derived from Ceftriaxone | Drugs | BNFC | NICE:

- adults – dose 2g stat
- children with body weight 50kg and over or aged 9 years and older – dose 2g stat
- children up to 50kg body weight or aged under 9 years – dose 80 to 100 mg/kg (maximum per dose 4g)

Alternatively, immediate single dose of IV/IM benzylpenicillin for suspected meningococcal infections Benzylpenicillin sodium | Drugs | BNF | NICE:

- adults and children aged 10 years or over – dose of 1.2g
- children aged 1 to 9 years – dose of 600mg
- children aged under 1 year – dose of 300mg

All suspected cases of invasive meningococcal disease are statutorily notifiable by registered medical practitioners to the responsible health protection team (see section 7).

6. Laboratory investigation of suspected cases

Patients with suspected meningococcal disease should have appropriate samples taken for bacterial culture, ideally prior to antibiotic administration, as well as polymerase chain reaction (PCR) testing. The source of sampling will depend on clinical presentation and may include blood, cerebrospinal fluid (CSF), joint fluid and/or pleural fluid. A bacterial throat swab should also be taken from all cases with suspected meningococcal disease – a positive meningococcal isolate will provide important information about the infecting strain in PCR-confirmed cases, which may be required for health protection management decisions. If there is a delay in obtaining samples for meningococcal PCR from patients, it may still be possible to retrieve suitable specimens from haematology and/ or biochemistry laboratories. When meningitis is present, CSF is the most appropriate and important sample for confirmatory testing. Whilst it may not be successful, this offers the best chance of yielding an organism for culture and importantly meningococcal DNA can be found in the CSF up to 96 hours after commencing antibiotics (36). When a patient presents with septicaemia with or without meningitis then blood culture and whole blood (EDTA) are extremely useful to support the diagnosis.

Under the Health Protection (Notifications) Regulations (2010), all diagnostic laboratories in England are required to notify UKHSA when they identify specific infections, including *Neisseria meningitidis*. The regulations state that “if the operator of the diagnostic laboratory considers that the case is urgent, the notification must be provided orally as soon as reasonably practicable”. Similar legislation applies in Wales and Scotland. Diagnostic laboratories in Northern Ireland voluntarily notify the Public Health Agency (PHA) when they identify specific infections, including Neisseria meningitidis. The Public Health (NI) Act 1967 is currently being updated.

The UKHSA Meningococcal Reference Unit (MRU) offers a national reference service for confirmation and characterisation of invasive meningococcal isolates in England, Wales and Northern Ireland. In Scotland this service is provided by the Bacterial Respiratory Infection Service, Scottish Microbiology Reference Laboratory, Glasgow Royal Infirmary. All invasive meningococcal isolates should be referred to the National Reference Laboratory for confirmation, serogrouping and whole genome sequencing, even if the case has already been confirmed by PCR. The National Reference Laboratories also offer a free service for meningococcal PCR of clinical samples from suspected IMD cases. If IMD is confirmed by a local diagnostic laboratory (including private laboratories), then the original sample, including extracts from PCRs, should be referred to the National Reference Laboratory to allow the capsular group to be confirmed or identified and for additional characterisation. In addition to the routine testing, further strain characterisation may be undertaken in certain situations, such as outbreaks.

Meningococci isolated from a symptomatic urogenital or anorectal infection (37) or any such isolates (from symptomatic or asymptomatic individuals) considered to be epidemiologically-linked to cases of invasive meningococcal disease should be submitted to the respective national meningococcal reference laboratories for confirmation and further characterisation. All meningococcal isolates from urogenital/ anorectal sites (from symptomatic or asymptomatic individuals) with evidence of antibiotic resistance (penicillin MICs of >0.25 mg/L and/or ciprofloxacin MICs >0.03 mg/L) should similarly be submitted.

To identify and characterise N. meningitidis, a combination of traditional and molecular techniques are used. In general, organisms are cultured from blood, CSF or another sterile site. Strain differentiation is performed by the National Reference Laboratory and involves characterisation of capsular polysaccharide and some outer membrane proteins using a monoclonal antibody-based internationally-recognised typing scheme. This allows phenotypic classification by capsular group, type and subtype. The MRU real-time PCR assay also allows capsular group determination for the major disease-causing serogroups (MenA, MenB, MenC, MenW and MenY). Over 50% of IMD cases in England, for example, are now confirmed by PCR only. PorA and fHbp sequencing is also applied to non-culture samples (if there is sufficient DNA) and has the potential for use in outbreak investigations.

High resolution genotypic analysis (via whole genome sequencing (WGS)) is used to identify genetic relationships between organisms during outbreaks as they evolve over time and to provide MenB vaccine antigen genotyping. MenB characterisation using Meningococcal Antigen Typing System (MATS), genetic (g)MATS or Meningococcal Deduced Vaccine Antigen Reactivity (MenDeVAR) is used for assessing vaccine strain coverage. WGS and MATS/gMATS/MenDeVAR can be expedited for use in outbreak situations but decisions may need to be made before these are completed in order to achieve protection as early as possible (38, 39).

Detailed descriptions of MRU tests, including specimen types required, can be found in the Meningococcal Reference Unit (MRU) user manual.

In Scotland, the user manual is available at Scottish Microbiology Reference Laboratories - NHSGGC.

Recommendation 2: Laboratory investigation

The following specimens should be collected on, or soon after, admission to hospital from all patients (ideally before initiating antibiotics) when meningococcal infection is considered in the differential diagnosis:

- blood for culture
- blood for PCR (ideally EDTA or, alternatively, other unclotted blood specimen)

- if meningitis suspected, CSF for microscopy, culture and PCR - lumbar puncture should not be done if it is contraindicated but can be delayed until it is safe to perform
- for other localised infections, aspirate from sterile site according to clinical indication (for example, joints) for microscopy, culture, PCR
- nasopharyngeal (throat) swab for meningococcal culture (**all suspected cases**); a positive meningococcal swab should **not** be used to diagnose meningococcal disease (for example, pneumonia). However, in PCR-confirmed cases, a positive nasopharyngeal swab culture provides important information about the infecting strain for the purpose of public health management and should, therefore, be submitted to the National Reference Laboratory for additional characterisation

Important: All meningococcal-positive clinical materials (including isolates, PCR-positive clinical samples and/or DNA extracts) should be referred to the National Reference Laboratory for confirmation, serogrouping and further characterisation, even if the case has already been confirmed locally.

Where laboratory confirmation is made using a point-of-care testing platform (for example, Biofire, QiaSTAT), it is important to ensure any residual positive sample is forwarded to the National Reference Laboratory for genogrouping and further characterisation.

As part of enhanced national surveillance, UKHSA previously requested acute and convalesecent blood samples from English and Welsh patients with confirmed IMD to assess disease and vaccine responses. **These samples are no longer required.**

In the event of a sudden unexpected death where IMD is suspected and samples were not obtained pre-mortem, post mortem samples referred to the National Reference Laboratory may be helpful in establishing a possible cause of death. Since administering antibiotics prior to taking microbiological specimens is likely to yield negative bacterial cultures from invasive samples, additional investigations such as molecular testing, including PCR testing for IMD and other infectious diseases, should be routinely performed and throat swabs collected (40).

Laboratory investigations in Scotland:

For children and adults in Scotland a multiplex RT-PCR is available for the detection of *N. meningitidis* DNA from CSF, serum or whole blood (EDTA or other unclotted sample), or any fluid from a normally sterile site, such as joint aspirate. Sample submission forms are available to download.

Important note: other investigations should be performed according to clinical indication.

Invasive meningococcal cases due to rare serogroups, recurrent disease, with strong family history or that arise after conjugate vaccination (see section 8.5)

IMD cases with a strong family history of IMD, recurrent IMD due to any serogroup, and/ or IMD **in a case aged under 25 years** due to a rare serogroup (including MenY cases or non-encapsulated meningococci (non-serogroupable)) are unusual. Additional investigations should therefore be strongly considered, especially for presence of spleen, splenic function, complement deficiency and HIV testing. IMD due to the respective serogroup after MenC or MenACWY conjugate vaccination is rare and should be similarly assessed for possible underlying conditions. Such cases should be discussed with the UKHSA national immunisation and meningococcal reference laboratory team. A template letter for the GP is available and is used by the UKHSA national immunisation team for follow-up where appropriate (Meningococcal public health communication templates are available to download).

7. Role of public health

Health protection teams have a major role in the management of meningococcal disease by ensuring that there are adequate disease prevention and surveillance programmes in place, preventing secondary cases through contact tracing, and rapidly investigating and managing clusters and outbreaks.

Meningococcal meningitis and septicaemia are statutorily notifiable by registered medical practitioners under the Health Protection Legislation (2010), under Health Protection (Wales) Regulations (2010) upon suspicion of meningitis (acute) and meningococcal disease, under Scottish legislation as meningococcal infection and under Northern Ireland as meningococcal septicaemia or acute meningitis (bacterial). Clinicians should inform the proper officer, usually an experienced member of the local health protection team, as soon as a case of meningococcal disease is **suspected** in a patient so that appropriate public health assessment and actions can be undertaken.

In England, Scotland and Northern Ireland, health protection teams should enter all the details of the reported cases on the appropriate national web-based software for public health management of infectious diseases, including any public health actions taken. In Wales, the All Wales Acute Response (AWARe) Team (Health Protection) will enter information onto the equivalent case and incident management system (Tarian).

England

To notify a possible, probable or confirmed case in England, contact your local HPT.

Scotland

In Scotland an overview can be accessed at Overview: notifiable diseases, health risk states and infections.

Find Scotland health protection team details at Health protection team contacts: general enquiries.

Wales

To notify a possible, probable or confirmed case in Wales: during office hours (Monday to Friday 9am to 5pm) or outside of office hours (Monday to Friday 5pm to 9am; weekends and bank holidays) please contact the All Wales Acute Response (AWARe) Team on 0300 00 300 32.

Northern Ireland

To notify a case in Northern Ireland please contact the Public Health Agency in office hours on 0300 555 0119 and out of hours on 028 90404090 (ambulance control) and request to speak with the public health specialist on call.

Recommendation 3: Role of public health

Health protection teams should ensure that policies are in place, ideally through a mechanism such as a service level agreement, which recognises the corporate responsibility of the NHS. Policies should ensure that:

- cases are referred early to hospital
- cases are reported promptly to the health protection team
- cases in hospital are investigated appropriately
- contacts are traced and given appropriate information
- appropriate chemoprophylaxis and vaccination is accessible
- information can be cascaded to others, as appropriate, including primary care, schools or universities, education authorities, National Health Service helplines, meningitis charities, employers
- communication with the media is appropriate and efficient giving due consideration to case (and family) confidentiality

All cases where IMD is suspected should be promptly notified by clinicians to the health protection team, without waiting for microbiological confirmation. Important note: notification is a legal requirement.

Evidence grade D

An experienced member of the health protection team should ensure that comprehensive information on cases is gathered to contribute to local public health management and surveillance with details set out in the national enhanced surveillance of vaccination programmes targeting invasive meningococcal disease in England. The data set should include epidemiological, laboratory and clinical information. This should be recorded on HPZone/ CIMS[1] (England, Scotland and Northern Ireland) or Tarian (Wales).

For confirmed cases, the UKHSA national surveillance form (MENSV01) detailed in the national enhanced surveillance for meningococcal disease in England or local equivalent covering the same detail should be completed and uploaded to HPZone[1]. Surveillance forms for Scotland are available to download. In Wales, the national enhanced surveillance form should be completed for all confirmed cases. No additional surveillance forms require completion in Northern Ireland.
Data for local management and audit programmes should include:

Case

- name and address including post code, telephone number, details of general practitioner
- dates and times of disease onset, hospital admission or reporting

[1] HPZone is due to be replaced with Case and Incident Management System (CIMS) from May 2024 in England.

- ethnic group
- occupation or workplace
- university, school, college or nursery attended
- meningococcal vaccination history
- antibiotics given prior to admission
- name of hospital or ward
- name of consultant
- specimens and dates and types of specimens
- recent travel history and underlying risk factors (asplenia, splenic dysfunction, complement deficiency, HIV status)

Contacts

- addresses and telephone numbers
- details of antibiotics, vaccine or information given and by whom
- details of GP

Notifier

- name, address and occupation

8. Public health action after a case

8.1 Risk to close contacts

Around 97% of cases are sporadic (41). Although the risk to contacts is low, the highest absolute and relative risk is to people who live in the same household as a case of meningococcal disease (41, 42, 36). This risk is highest in the first 7 days after a case and falls rapidly after this period (41). The absolute risk (AR) of developing a second case of IMD within 30 days of an index case is 1 in 300 if chemoprophylaxis is not administered (8). Beyond this period, the risk of meningococcal disease among household contacts is near background levels (41), although later secondary cases have been observed. The increased risk to household members is thought to be due to shared exposure to meningococci in the contact group, although environmental factors and genetic susceptibility in the family may contribute.

The rationale for giving antibiotic chemoprophylaxis to close contacts of IMD cases is to eliminate established carriage from the close contact group and, thereby, to reduce onward transmission. This strategy reduces the risk of secondary cases in household contacts by up to 89% (95% CI, 42 to 98%) (43). In such circumstances, the number needed to treat (NNT) – that is, the number of close contacts receiving chemoprophylaxis to prevent one IMD case – is estimated to be 218 (95% CI, 121 to 1,135) (5).

The case is likely to have acquired the invasive strain from a close contact, typically in the same household, who is an asymptomatic carrier (44, 45). The incubation period is usually 3 to 5 days (11, 13) and cases do not usually have detectable carriage until admission to hospital or shortly beforehand (13). As the highest risk of IMD in close contacts is in the first 48 hours after disease onset in the index case (42) the source of infection in secondary cases is most likely to be from the same (or another) carrier and not from the index case.

Antibiotic chemoprophylaxis also eradicates carriage in those who have newly acquired the invasive strain and who may themselves be at risk of IMD. In this instance, individuals who have prolonged close contact with the case after the onset of illness but before the case is treated with antibiotics would also benefit from antibiotic chemoprophylaxis.

It follows that transient contact with the index case before acute illness is unlikely to be a significant risk factor for disease; therefore, mere proximity to the case (for example during travel in a plane, bus or car) does not justify prophylaxis. Although European Centre for Disease Prevention and Control (ECDC) guidance indicates flight contact tracing only where there has been intense exposure to nasopharyngeal secretions, the value of this may be limited once the individuals have dispersed (46).

Whilst the US guidance recommends that passengers seated next to the index case on a plane for more than 8 hours should be offered prophylaxis, only one such possible on-board

transmission was detected in a review by ECDC with onset of symptoms 2 and 5 days after landing in 2 passengers who had sat 12 rows apart. A further possible on-board transmission was identified during an international Scout outbreak where a Japanese couple developed symptoms 3 to 4 days after the flight. In both these scenarios, it is unlikely that the ECDC-recommended post-exposure prophylaxis (contact tracing for those sitting next to and/or directly exposed to oral secretions of the index case) would have prevented these cases (46).

As the source of the meningococcal infection may sometimes be outside of the defined population – be it a household or a school – it may not be possible to prevent the meningococci from re-entering the group and, consequently, leading to additional cases in that group. Vaccination of close contacts of an index case can help prevent secondary IMD cases occurring more than 14 days after disease onset in the index case (see section 8.5: Aim of vaccination) (47).

Focus 1. Case definitions

The following situations require public health action:

Confirmed case

Clinical diagnosis of meningitis, septicaemia or other invasive disease (for example, orbital cellulitis, septic arthritis) and at least one of:

- *Neisseria meningitidis* isolated from a normally sterile site
- Gram-negative diplococci identified in a normally sterile site
- meningococcal DNA in a normally sterile site
- meningococcal antigen in blood, CSF or urine

Although not meeting the definition of a confirmed case, **meningococcal infection of the conjunctiva** is considered an indication for public health action (including treatment for the case and antibiotic prophylaxis for close contacts, but not vaccination) because of the high immediate risk of invasive disease.

Probable case

Clinical diagnosis of meningitis or septicaemia or other invasive disease where an experienced member of the health protection team, in consultation with the physician and/or microbiologist, considers that meningococcal infection is the most likely diagnosis (see: Focus 3 for sources of materials on characteristic symptoms and signs of meningococcal disease in different age groups).

Some microbiological tests (for example, rising antibody levels) that are not considered sufficient to confirm the diagnosis may change the case category from ‘possible’ to ‘probable’.

For cases of meningitis or septicaemia with clinical and laboratory evidence of bacterial infection but where the causative pathogen is not known, meningococcal disease should be considered in the differential diagnosis, especially in previously healthy children and young adults. Where *Neisseria meningitidis* could be responsible and there is no alternative diagnosis at that time, such cases should be considered as 'probable' IMD

Focus 2. Definition of close contacts

Close contact

Meningococcal bacteria that are usually carried harmlessly in the back of the nose and throat with transmission most likely to occur after close and prolonged contact or after sexual or other intimate contact that enables the spread of the bacteria. Close contact is defined as prolonged close contact with the case in a household type setting during the 7 days before onset of illness. Examples of such contacts would be those living and/or sleeping in the same household, pupils in the same dormitory, boy or girlfriends, or university students sharing a kitchen in a hall of residence (evidence grade B)

The definition of close contact does not include (evidence grade C):

- staff and children attending same nursery or crèche (note – see caveat below)
- students or pupils in same school, class or tutor group (note – see caveat below)
- work or school colleagues
- friends
- residents of nursing or residential homes
- kissing on cheek or mouth (intimate kissing would be considered close, prolonged contact)
- food or drink sharing or similar low level of salivary contact including shared vapes
- attending the same social function
- travelling in next seat on same plane, train, bus, or car (in the absence of intense exposure to nasopharyngeal secretions – see section 8.1)

This list is not exhaustive and should be considered in context for any individuals when prolonged contact has taken place, for example, with multiple episodes of shared vaping, drinking or straw sharing in an enclosed and intimate setting like a club.

Smoking and exposure to second-hand smoke increase the risk of developing invasive disease after acquisition of the bacteria. Where smoking apparatus is shared in an enclosed and intimate setting over a prolonged period, as often occurs with a communal shisha, the risk of transmission is increased, likely due to associated coughing and effects of the smoke on the epithelium of the respiratory tract rather than bacterial transfer via the apparatus itself (48).

Sharing of a communal shisha may not in itself identify close contacts but the duration, frequency and intimacy of the setting are important factors to be considered.

Caveat: contact in an educational setting

Educational settings include pre-schools, primary schools, secondary schools, colleges and universities. The term 'pre-school' is used synonymously with child-minders, playgroup, nursery, day care or crèche. Within an educational setting, however, it may be possible to define a group that fulfils the definition of a close contact (for example, in a child-minder setting) and, therefore, have a higher risk of developing secondary IMD. Such groups might benefit from public health action (evidence grade D).

Situations that do not require public health action:

Possible case

Clinical diagnosis of meningitis or septicaemia or other invasive disease where an experienced member of the health protection team, in consultation with the clinician and microbiologist, considers that another diagnosis, such as a viral illness, is more likely than IMD. Information dissemination after a possible case may still be considered (see Recommendation 8).

Isolation of meningococci from non-sterile sites

- isolation of meningococci from sputum, nasopharynx or bronchoalveolar lavage is not by itself an indication for public health action because asymptomatic carriage is common

- non-bacteraemic meningococcal pneumonia, is not an indication for public health action but may carry a small risk of transmission in healthcare settings, especially to the immunocompromised (49, 50)

Where meningococci are isolated from a symptomatic urogenital/ anorectal infection, standard treatment for gonorrhoea or non-specific urethritis is expected to clear the meningococci. In asymptomatic individuals, treatment is not recommended because asymptomatic carriage is common

additionally, no further public health management of contacts of individuals with symptomatic or asymptomatic urogenital/anorectal meningococcal infection is required, but isolates should be referred to the meningococcal reference laboratories for confirmation and further characterisation

Contacts that do not meet the close contact definition

After a single IMD case, the risk of additional linked IMD cases outside of the close contact group is low because of the low likelihood of exposure to the responsible strain (45). In England and Wales during 1995 to 2001, after one case in a pre-school group, a primary school or a

secondary school, the absolute risks to each child or pupil in the same institution of becoming a case within the next 28 days were approximately one in 1,500, one in 18,000 and one in 33,000, respectively (7).

Antibiotic prophylaxis of other contacts is not recommended in educational settings after a single case because the benefits in this setting are largely unknown. The potential for risk reduction is limited by the interval between disease confirmation in the case and time to antibiotic administration within the institution; moreover, harm may arise from drug side-effects, development of antibiotic resistance, and eradication of naturally immunising strains from the nasopharynx. This particularly applies in young children who are more likely to be carrying the commensal *Neisseria lactamica* than *Neisseria meningitidis* (51).

Reports of clusters in other settings (for example, the workplace) are rare and the level of risk is considered to be much lower than in educational settings. As explained previously, transient contact with the index case before acute illness is unlikely to be a significant risk factor for disease, so that mere proximity to the case may not justify prophylaxis. Low-level salivary contact is also not considered to be a risk factor (52). No cases have been reported following post-mortem contact with an IMD case. Embalming is not considered a hazard for transmission.

For recommendations following a case in a healthcare worker see section 9 (Recommendation 9).

8.2 Risk reduction through chemoprophylaxis

A 2014 systematic review suggested an 84% reduction in the risk of subsequent cases of IMD within 30 days, among household contacts given chemoprophylaxis, with 200 household contacts needing to be treated to prevent one subsequent case of IMD within 30 days (53). A review of retrospective observational studies found a significantly reduced risk of additional cases in the household during the month after a case among household members given rifampicin prophylaxis (43). Two randomised controlled trials found no difference in the protection afforded by ciprofloxacin compared to rifampicin (54). In relatively small studies, a single dose of intramuscular ceftriaxone was more effective in eradicating pharyngeal carriage than 4 doses of rifampicin over 2 days, while other studies found oral cefixime and azithromycin to be as effective as rifampicin (55, 56, 57).

In an ECDC review (58), rifampicin, ciprofloxacin, ceftriaxone, cefixime and azithromycin were all recommended for preventing secondary cases of meningococcal disease. In the UK, ciprofloxacin is the recommended chemoprophylaxis of choice and rifampicin is a suitable alternative (59). Ceftriaxone must be given by injection.

In the past, ciprofloxacin was not recommended in children due to induced arthropathy in juvenile animals, but abundant evidence of lack of joint damage has been found in young

children given ciprofloxacin. In one RCT on carriage eradication, ciprofloxacin when compared to rifampicin did not lead to a higher rate of side effects (60). Multiple controlled prospective and retrospective studies, using higher doses of ciprofloxacin, showed that the rate of adverse events of ciprofloxacin in children was similar to that seen using other antibiotics, and that long-term cartilage damage was not seen in humans (61, 62). In all studies, the risk of arthropathy due to ciprofloxacin was very low; arthralgia was transient and most cases were coincidental. A controlled study of 116 neonates receiving ciprofloxacin also showed similar clinical growth compared to 100 controls, even at one year of follow-up (63). The risk of tendon disorders in a large retrospective study involving 4,531 children given ciprofloxacin was similarly low compared to children given azithromycin (0.8%) (64). In all studies, side effects resolved after cessation of therapy.

Recommendation 4: Indications for antibiotic prophylaxis

Prophylaxis indicated

Chemoprophylaxis should be offered to close contacts, irrespective of vaccination status, of cases that require public health action (see case definitions Focus 1) in the following categories:

- those who have had prolonged close contact with the case (including conjunctivitis) during the 7 days before onset of illness (See Focus 2 for definitions)
- those who have had transient close contact with a case only if they have been directly exposed to large particle droplets or secretions from the respiratory tract of a case around the time of admission to hospital

Evidence grade B

Prophylaxis for the case

Cases treated with intravenous or intramuscular cephalosporins (for example, ceftriaxone, cefotaxime) do not require antibiotic chemoprophylaxis (65, 66). If the case (including conjunctivitis cases) is treated with any other antibiotic, chemoprophylaxis should be offered when the case is able to take oral medication and, ideally, before discharge from hospital.

Evidence grade C

Prophylaxis uncertain

The division between those who do and do not receive prophylaxis can be arbitrary as evidence on risk and benefit is limited outside of the household setting. The health protection team will need to use their judgement to decide whether or not to advise prophylaxis for those who do not clearly fall into the close contact or excluded categories in Focus 2. For example, when a case occurs in a group of children looked after by the same child minder or among a circle of close friends, an assessment should be made as to whether these exposures meet the definitions of a close contact.

Timing

Antibiotic prophylaxis should be given as soon as possible (ideally within 24 hours) after the diagnosis of the index case.

Recording of antibiotic administration

When antibiotics are prescribed outside general practice for contacts, the GP practice of each recipient of antibiotic prophylaxis should be informed so that an up-to-date medical record can be retained for their registered patient.

Other situations

Dispersal settings

In settings where close contacts have been identified and where contact has now finished, for example those sleeping in the same room on holiday or at university, attempts should be made to arrange chemoprophylaxis within one week of dispersal if practicable.

Evidence grade D

Post-mortem contact with a case

Prophylaxis is not indicated. Kissing the body is not considered to be a risk. Body bags are not necessary, and transport to other countries for burial or cremation does not pose a risk. There is no restriction on embalming.

Evidence grade D

Contacts of possible cases

Contacts of possible cases do not need prophylaxis unless or until further evidence emerges that changes the diagnostic category to confirmed or probable.

Evidence grade D

Delayed diagnosis or notification

If the health protection team receives a delayed report of the case, close contacts (as defined above) should be offered chemoprophylaxis, and vaccine if appropriate, up to 28 days after onset of illness (low risk of further cases after this period).

Evidence grade D

Cases in contacts who have received prophylaxis

If further cases occur within a group of close contacts in the 28 days after receiving prophylaxis, an alternative agent should be used for repeat prophylaxis.

8.3 Choice of agent for chemoprophylaxis

There have been recent EU-wide restrictions and precautions on the use of systemic fluoroquinolone antibiotics (including ciprofloxacin), due to very rare reports of serious side-effects. In view of the most recent UK Medicines and Healthcare products Regulatory Agency (MHRA) position on their use in January 2024,[2] the current chemoprophylaxis recommendations were reassessed and the risk of complications after a single stat dose of ciprofloxacin for meningococcal prophylaxis, if any, was considered to be extremely small whilst the benefits of preventing secondary cases of meningococcal disease are very high.[3]

Ciprofloxacin, therefore, remains the recommended choice for meningococcal chemoprophylaxis because it has a number of advantages over rifampicin (54). It is given as a single dose, does not interact with oral contraceptives, and is more readily available in community pharmacies; it is licensed for this indication in adults. It is contraindicated in cases of known ciprofloxacin hypersensitivity. In meningococcal disease and conjunctivitis cases who have travelled outside UK in the 7 days prior to disease, it is important that antibiotic sensitivity testing is completed. High levels of ciprofloxacin resistance have been reported in Asia and the Middle East (67, 68) (see Rifampicin and travel). Note that levels of resistance remain low in the UK (69).

Rifampicin is a suitable alternative although disadvantages include; selection of resistant bacterial subpopulations, inhibition of contraceptives, requirement for multiple doses over 2 days and availability usually only from hospital pharmacies. Both products are available in preparations suitable for children.

Although benzylpenicillin suppresses meningococcal growth in the throat, it does not reliably eradicate carriage. Around 5% of cases treated with benzylpenicillin still carry the invasive strain after completing treatment and before discharge from hospital (70, 71, 72). Convalescent cases may then pose a risk to household contacts unless given a course of antibiotic treatment to eradicate carriage.

Recommendation 5: Choice of agent for antibiotic prophylaxis

Ciprofloxacin
Recommended for use in all age groups and in pregnancy.

Evidence grade B

The administration of ciprofloxacin may rarely be followed by anaphylactic reactions (73, 74). Healthcare staff should give out information sheets that include the risk of side effects[4] and be prepared to deal with allergic reactions. Ciprofloxacin can also interact with other drugs but a

[2] Fluoroquinolone antibiotics: must now only be prescribed when other commonly recommended antibiotics are inappropriate
[3] See EC final decision Quinolone and fluoroquinolone Article 31 referral: PRAC recommends restrictions on use (updated 19 March 2019) page 24, table 11.
[4] See Meningococcal public health communication templates.

single dose is unlikely to have a significant effect. It has an unpredictable effect on epilepsy but may be preferable to rifampicin if the patient is on treatment with phenytoin (see notes below).

Ciprofloxacin dosage (for one dose) [note 1]
All to be given as a single dose:

adults and children aged 12 years and over	500 mg stat
children aged 5 to 11 years	250 mg stat
children aged 1 to 4 years	125 mg stat
infants under 1 year [note 2]	30 mg/kg to a maximum 125mg stat

[note 1] Ciprofloxacin suspension contains 250 mg/5ml.
[note 2] prescribed off-label.

Rifampicin

Alternative to Ciprofloxacin in all age groups.

Evidence grade B

Rifampicin and travel

It is important that recent travel history (within 2 weeks of symptom onset), including place and dates of travel, are established for all cases of invasive meningococcal disease and meningococcal infection of the conjunctiva reported to HPTs and that this information is recorded on HPZone/CIMS.

Because of increasing reports of ciprofloxacin resistance among invasive meningococcal strains in the Middle East and Asia, rifampicin is recommended for first-line prophylaxis in close contacts of both invasive disease and conjunctivitis cases with recent travel to the Middle East or Asia. Rifampicin should also be offered for such cases not treated with cephalosporins. If ciprofloxacin has already been given, then HPTs should determine the antibiotic susceptibilities available from the NHS laboratory [5] and ensure the strain is referred to the UKHSA Meningococcal Reference Unit, Manchester promptly. If the strain is confirmed as being due to a non-groupable meningococcus and/or if ciprofloxacin resistance is identified, close contacts of both invasive disease and conjunctivitis cases should receive rifampicin prophylaxis.

Rifampicin is contraindicated in the presence of jaundice or known hypersensitivity to rifampicin. Interactions with other drugs, such as anticoagulants, phenytoin, and hormonal contraceptives should be considered. Side effects should be explained including staining of urine and contact lenses. Written information for patients should be supplied with the prescription. This is the responsibility of the prescriber.

[5] EUCAST Guidelines for antimicrobial susceptibility.

Rifampicin dosage

All doses below to be given twice daily for 2 days:

Adults and children aged 12 years and over	600mg
Children aged 1 to 11 years	10 mg/kg (maximum dose of 600mg)
Infants (under 12 months of age)	5 mg/kg

Suitable Rifampicin doses in children based on average weight for age are:

0 to 2 months	20 mg (1 ml) [note 1]
3 to 11 months	40 mg (2 ml) [note 1]
1 to 2 years	100 mg (5 ml) [note 1]
3 to 4 years	150 mg (7.5 ml) [note 1]
5 to 6 years	200 mg (10 ml) [note 1]
7 to 12 years	300 mg (as capsule/or syrup)

[note 1] Rifampicin syrup contains 100 mg/5 ml.

8.4 Pregnancy and breastfeeding

The safety of antibiotic regimens for chemoprophylaxis in pregnant and lactating women is poorly described. Animal reproduction studies have failed to demonstrate a risk to the foetus but there are no well-controlled studies in pregnant women. Because animal reproductive studies are not always predictive of human response, antibiotic chemoprophylaxis should be used during pregnancy only if clearly needed. A single dose of ciprofloxacin can be used for the prevention of a secondary case in pregnancy [see British National Formulary], because short duration treatment for other indications appears to be safe (75, 76, 77, 78). Of the alternative antibiotics, rifampicin teratogenicity has been reported in animals receiving high doses, but epidemiological studies have not identified any risk in humans when administered for tuberculosis treatment (79). Another clinical trial involved 176 pregnant and lactating women, administered ceftriaxone (2g) via the intra-muscular route, and only 5 subjects reported mild side effects; there was, however, no control group (60). For breastfeeding infants, a systematic review of antibiotic use in lactation considered ciprofloxacin and rifampicin as compatible with breastfeeding; other antibiotics were not studied (80).

Recommendation 6: Antibiotic chemoprophylaxis for pregnant women

Either ciprofloxacin, ceftriaxone or azithromycin can be used as chemoprophylaxis in pregnancy.

Evidence grade C

Ciprofloxacin has the advantage of being easy to access in the community and in short duration usage appears to be safe in pregnancy. Ceftriaxone can only be given by injection and can be painful. Potential side effects include diarrhoea, allergies, hepatic and blood disorders. A single dose of azithromycin may be offered for chemoprophylaxis for pregnant women (Dosage: Azithromycin 500mg stat).

8.5 Aim of vaccination

Meningococcal vaccination is offered to those at close prolonged contact with the index case to reduce the risk of late cases through longer-term direct protection. The risk of late cases may be due to increased exposure to virulent meningococci, to environmental factors or to increased susceptibility in the family. In cases caused by vaccine preventable strains, vaccination would be expected to reduce the long-term risk of disease in close contacts. The estimated number of unimmunised close contacts needed to vaccinate to prevent a case was estimated to be approximately 1,000 cases based on confirmed MenC IMD cases (47).

For MenB, the numbers needed to vaccinate to prevent a single case are substantially higher because at least 2 doses are required for protection (81). More importantly, the protein-based MenB vaccines are unlikely to afford adequate protection rapidly enough after a single dose (especially for young children who are at highest risk) and most secondary cases occur within a few days of onset in the index case (7). MenB vaccines do not cover all MenB strains.

Vaccine is not indicated for those who received chemoprophylaxis for transient contact, in dispersal settings or for close contacts of conjunctivitis cases.

Meningococcal cases provide an opportunity to complete the national vaccination schedule in cases and contacts who are eligible according to current national recommendations for their age. Health protection teams should ensure that all unimmunised and partially immunised cases receive meningococcal vaccination according to national recommendations for their age (Recommendation 7).

Recommendation 7: Vaccination

Vaccination of the index case

Unimmunised or partially immunised index cases should receive all their missed meningococcal vaccinations according to the nationally recommended schedule for their age cohort and national guidance, when they have recovered from their illness. Individuals who have missed MenACWY vaccine at 13 or 14 years are eligible up to their 25th birthday and children aged under 2 years who have not completed MenB vaccination should be brought up to date. See information available at Vaccination of individuals with uncertain or incomplete immunisation). Fully immunised cases do not require additional vaccination as they are expected to have developed an immune response (but see paragraph below for at-risk cases).

Evidence grade D

At-risk index cases (for example asplenia, complement-deficiency) who are unimmunised or partially immunised against IMD should be appropriately immunised. Current recommendations include the MenACWY conjugate vaccine (2 doses at least 4 weeks apart if aged less than 1 year; 1 dose after first birthday) and the MenB vaccine, 4CMenB (Bexsero®) (2 doses, 8 weeks apart with a booster at 12 months for children aged less than 1 year-olds; 2 doses 8 weeks apart for 1 to 10 year olds; 2 doses 4 weeks apart for older children and adults).

Evidence Grade C

The importance of daily penicillin prophylaxis, as prescribed by the clinician responsible for their care, should be emphasised for at-risk indivduals.

Evidence Grade B

Vaccination of close contacts

MenACWY

For confirmed serogroup A, C, W or Y infections, close contacts of any age should be offered the MenACWY conjugate vaccine, unless they are confirmed to have been immunised against the relevant meningococcal serogroup within the preceding 12 months (2 doses 4 weeks apart if aged less than 1 year; 1 dose after first birthday). For close contacts of MenC IMD cases, another MenC-containing conjugate vaccine (for example Menitorix®, NeisVac®, MenQuadfi®) would be a suitable alternative.

Evidence grade D

MenB

After a single case of confirmed or probable serogroup B infection, vaccination against MenB is not recommended for close contacts, even if the strain is identified as vaccine-preventable.

At-risk close contacts

Eligible at-risk close contacts (for example asplenia, complement-deficiency) who are unimmunised or partially immunised should be appropriately immunised for their age. Current recommendations include the MenACWY conjugate vaccine (2 doses 4 weeks apart if aged less than 1 year; 1 dose after first birthday) and MenB vaccine (2 doses 8 weeks apart with a booster at 12 months for less than 1 year-olds, 2 doses 8 weeks apart for 1 to 10 year-olds and 2 doses 4 weeks for older children and adults).

For confirmed serogroup A, C, W or Y infections, fully immunised at-risk close contacts should be offered the MenACWY conjugate vaccine, unless they have received a MenACWY vaccine in the previous 12 months (2 doses 4 weeks apart if aged less than 1 year; 1 dose after first birthday).

The importance of daily penicillin prophylaxis for at-risk individuals should be emphasised.

Evidence Grade B.

National recommendations for vaccination against meningococcal disease are available in the Meningococcal: the green book, chapter 22 and in the vaccination of individuals with uncertain or incomplete immunisation status.

Other contacts (who do not meet the definition for close contact – see Focus 2)
After a single confirmed or probable IMD case, vaccination is not recommended for other contacts, including those who received chemoprophylaxis for transient contact or in a dispersal setting.

8.5.1 Previously immunised IMD cases

The term ‘vaccine failure’ should be used cautiously in previously immunised IMD cases. No vaccine is 100% effective and vaccine-induced antibodies will wane with time since vaccination. The duration of protection offered by conjugate vaccines, especially in infants and toddlers, is shorter than originally estimated (17). The vast majority of children and adults who develop IMD, including those who are immunised with any of the meningococcal vaccines, are healthy and have no underlying medical problems. However, IMD after teenage meningococcal conjugate vaccination (for example Men A, C, W, or Y disease after MenACWY conjugate vaccine) is uncommon and such cases should therefore be assessed for possible underlying risk factors, including asplenia and complement deficiency (82). HIV – undiagnosed or treated - is also a rare but important risk factor for IMD (83). Those with 2 or more IMD episodes and those with IMD due to unusual capsular groups are also more likely to have underlying risk factors and should be similarly investigated.

Since 4CMenB (Bexsero®) only protects against 73 to 88% of invasive MenB strains, 4CMenB (Bexsero®) failure can only be confirmed in a fully immunised individual if the responsible isolate is identified to be vaccine covered by MATS (MATS-positive). Sequence based methods (gMATS/MenDeVAR), based on MATS, may serve to indicate probable coverage (84, 85). 4CMenB (Bexsero®) coverage cannot be definitively determined for cases confirmed by PCR only, unless the strain possesses the PorA P1.4.

8.6 Disseminating information

Following a single IMD case, it is important to give out information as early diagnosis and treatment should improve outcome. There is a small but real risk of further linked cases (41). Vigilance for signs and symptoms among close contacts is important especially in the immediate high-risk period (one week) after a case. It is important that this information makes it clear that there are many meningococcal strains that can cause IMD and current vaccines do not protect against all the strains, therefore awareness of symptoms and signs remains critical.

Accurate and timely information should help to limit the spread of false rumours and anxiety and may help early identification should a further case arise.

Recommendation 8: Disseminating information

Leaflets or other information about IMD should be widely available and quickly distributed after reporting of a confirmed or probable case. This may also be helpful after a possible case depending on levels of concern, and is a matter for local judgment. See Focus 3 for useful resources for example free leaflets and template letters are available to download.

Evidence grade D

An experienced member of the health protection team should ensure that information about an IMD case is shared with other NHS colleagues and external agencies as necessary. It is important to inform any appropriate general practitioners and out-of-hours services, so that they know what public health action has been taken and to promote early recognition of any further cases. An experienced member of the health protection team may also wish to inform NHS helplines and the meningitis charities.

Evidence grade D

Cases in educational institutions

Heads of pre-school groups, schools, colleges and universities should be informed when there is a confirmed or probable IMD case in someone attending their institution. With the advice of an experienced member of the health protection team, letters are usually sent to other parents/students to inform them of the situation (template letters are available to download). It is recommended to inform and seek support for this action from the case or their relatives, as the letters may result in identification of the case. The purpose of the letter is to give information about IMD, assist parents and others in the early detection of the disease, allay anxiety and prevent uninformed rumours. It should also provide serotype-appropriate information on vaccination. If it is a MenB case, for example, it is helpful to highlight that current vaccines do not protect against all MenB infection even if a child has received MenB vaccination as part of the national immunisation programme (aged at least 8 weeks and born from 1 May 2015). It is therefore important to remain vigilant as an individual and as a parent even after vaccination.

The information given should be sufficient to ensure that parents are aware of the situation whilst preserving the confidentiality of the patient. It is usually helpful to explain what public health action has been taken.

If a **possible** case attends an educational institution, consider informing the head of the institution at an early stage. The head will then be in a good position to respond immediately to local concerns and will be able to access advice from the HPTs. Letters to other parents or students may be considered.

See also Meningitis and septicaemia prevention and management in higher education institutions. In Wales, there are contingency plans for communicable disease cases or clusters in educational establishments available to the AWARe Team (Health Protection).

Dispersal

If a case is reported within one week of date of last attendance at the institution, distributing information should be considered where practical. This is consistent with chemoprophylaxis in dispersal settings.

Evidence grade D

9. Chemoprophylaxis in healthcare settings

The risk of IMD in healthcare workers is very low (86). Healthcare workers who were more heavily exposed to nasopharyngeal secretions of cases around the time of admission to hospital were considered to be at higher risk (87, 88, 89, 90). UK guidelines for preventing hospital-acquired infections recommend wearing face masks and eye protection when there is a risk of secretions splashing into face and eyes (88, 89). Laboratory studies suggest that surgical masks can protect the wearer against droplet transmission (91, 92).

Meningococcal pneumonia may carry a low risk of transmission in healthcare settings especially to the immunocompromised (41, 49). Meningococcal pneumonia cannot be diagnosed from a sputum sample or from a nasopharyngeal (throat) swab culture because carriage is relatively common in the community. Diagnosis is usually made after the meningococcus is identified in a normally sterile site (typically, blood) – such cases of bacteraemic pneumonia should be managed as invasive disease.

Recommendation 9: Prophylaxis in healthcare settings

In Scotland please refer to National Infection Prevention Control Manual for Scotland
Healthcare workers should reduce the possibility of exposure to large particle droplets (for example by wearing surgical masks, using closed suction) especially when carrying out airway management procedures, so that chemoprophylaxis is not needed.

Evidence grade D

Chemoprophylaxis is recommended only for those healthcare workers whose mouth or nose is directly exposed to large particle droplets or secretions from the respiratory tract of a probable or confirmed case of meningococcal disease during acute illness until completed 24 hours of systemic antibiotics. This type of exposure will only occur among healthcare staff who are working close to the face of the case without wearing a mask or other mechanical protection. In practice this implies a clear perception of facial contact with droplets or secretions and is unlikely to occur unless using suction during airway management, inserting an airway, intubating, or if the patient coughs in your face. General medical or nursing care of cases is not an indication for prophylaxis. Ciprofloxacin 500mg as a single dose (or, alternatively, rifampicin 600mg orally twice daily for 2 days) is recommended for prophylaxis.

Evidence grade D

Exposure of the eyes to respiratory droplets is not considered an indication for prophylaxis. Such exposure may, however, carry a low risk of meningococcal conjunctivitis and subsequent invasive disease. Staff should be counselled about this risk and advised to seek early treatment if conjunctivitis should develop within 10 days of exposure.

Evidence grade D

Routine vaccination of healthcare workers with meningococcal vaccines is not recommended because the exposure is invariably transient and those at increased risk will be offered chemoprophylaxis.

Evidence grade D

Vaccination after contact with a confirmed or probable IMD case is also not recommended because the exposure is invariably transient and those at increased risk will be offered chemoprophylaxis.

Evidence grade D

The above recommendations also apply to contacts of cases in healthcare workers (including dentists), and to contacts of cases on a hospital ward where the diagnosis is initially unsuspected and not treated with systemic antibiotics. Chemoprophylaxis is not usually indicated for patient or staff contacts of such cases. A hospital ward is not equivalent to a household setting. However, the threshold for giving prophylaxis should be lower for immunocompromised contacts who may be at increased risk of invasive disease. Risk assessment is advised.

Evidence grade D

10. Clusters and management

IMD clusters occur most commonly within households. In a systematic review assessing the effectiveness of vaccinating household contacts in addition to chemoprophylaxis in outbreaks caused by Men A, C, W or Y, 6 eligible studies reporting a total of 4,730 primary cases and 30 household clusters with 40 secondary cases were identified (47). The attack rate using a fixed effects Poisson model for meta-analysis was 1.08 per 1,000 contacts (95% CI, 0.7 to 1.7) in the 14 to 365 days after disease onset in the index case. Using data from the 4 studies with a follow-up period of more than 31 days, the secondary attack rate after chemoprophylaxis was 20 to 90 per 100,000 household contacts (47). The authors estimated that between 640 and 1,680 household contacts would need vaccinating to prevent a secondary case (7, 47).

IMD clusters can also occur in a variety of community settings, particularly in institutions such as pre-schools, schools and residential halls of colleges/universities. Enhanced national surveillance indicated that there were approximately 16 IMD clusters annually in school settings and a further 3 in pre-school settings in England and Wales during 1995 to 2001 during a period of relatively high incidence (7). Over the same period (prior to and during the introduction of universal MenC conjugate vaccination), the overall risk of a cluster was similar for MenB and MenC disease. Most MenC cases occurred in secondary schools, while MenB clusters were more common in primary schools (7).

An increase in the relative risk (RR) and absolute risk (AR) of a cluster due to any capsular group following an initial case in these educational settings has been reported, with the risk being highest in pre-school (RR, 27.6; AR, 70 per 100,000) and lowest in secondary school (RR 3.6; AR, 3 per 100,000) settings (7). In most clusters, secondary cases occurred within one week of the index case (29% within 2 days, 68% within 7 days) and, by the end of the third week, the RR of a secondary case was similar to baseline. The majority of clusters (89%) had only 2 cases and, where third cases did occur, 93% were diagnosed within 6 days of a secondary case (although, in one cluster, a third case occurred 21 days after the second case).

A case-control analysis of school children in the USA (1989 to 1994) estimated the secondary incidence of IMD as 2.5 per 100,000 in school children aged 5-18 years, with relative risk of 2.3 (8). One third of cases occurred within 48 hours of the index case and 75% within 2 weeks. In secondary schools, where 75% of clusters occurred, 73% of secondary cases occurred within 2 weeks of the index case. When more than 2 cases were identified, in school-based clusters, the mean time between second and third cases was 1.6 days (range 0 to 5 days). No attempt was made in these studies to estimate any additional benefit of vaccination over chemoprophylaxis in preventing further cases.

In educational settings, once a second linked case has occurred, the risk of a third case has been reported to be as high as 30 to 50%, with the risk of a third case being highest in the week after the second case (7, 93). These studies were, however, conducted more than 2 decades ago when IMD incidence was higher. Where there is no direct connection between the 2 cases,

the risk of a third case remains low and is influenced by meningococcal circulation in the wider community rather than within the educational-setting itself. It is, therefore, important to gather as much information as possible on potential links if one is not immediately apparent.

The risk to staff in educational clusters is not known. However, of 6 clusters that contained confirmed cases among both staff and children in educational settings in England and Wales from 1995 to 2001, 5 involved pre-school groups or primary schools (7), suggesting a greater risk to teachers of young children.

Relative risk of additional cases in other settings has not been formally assessed, but outbreaks in definable social groups, civilian communities and military recruits are well-described (94). Although one trial of mass chemoprophylaxis in a closed community (military barracks) showed a significant effect on disease reduction (95), whether such interventions work in schools or civilian communities is not known (96, 97).The aim of such interventions is to eradicate carriage of the outbreak strain from a population at high IMD risk (98).

If an outbreak is caused by strains of a serogroup for which an effective vaccine exists, vaccination should be considered. Data from England and Wales showed that if the serogroup of one case had been identified and another case was diagnosed within 4 weeks in the same school, the second case was likely to be of the same strain as the first case (7). In the USA, vaccination of whole communities in community MenC IMD outbreaks is considered when a defined threshold is reached (93).

Assessment of the likely benefits and costs of interventions must then lead to a decision on public health action. External factors such as availability of staff, antibiotics, vaccine and feasibility of action (such as holidays just started) may well influence the decisions made (99). More evidence is needed on the effectiveness of such interventions.

10.1 Clusters in a household setting

An IMD household cluster is defined as 2 or more cases confirmed within 28 days in the same household. They may indicate increased susceptibility of family members to IMD and/or on-going transmission within the household setting. Such clusters are rare and occasionally may occur after longer intervals possibly due to re-introduction into the household. Following the introduction of the infant MenB immunisation programme in September 2015, the recommendations for MenB vaccination in a cluster setting were revised as set out in Recommendation 11.

Recommendation 10: vaccination following a household cluster

- when 2 or more IMD cases occur within 28 days in the same household and fulfil the definition of a cluster, then all close contacts (including the case) are recommended to receive the appropriate vaccine (MenACWY or MenB) in addition to antibiotic

prophylaxis unless they are confirmed to have been immunised against the relevant meningococcal serogroup within the preceding 12 months
- if additional cases occur within 28 days of receiving antibiotic prophylaxis, then an alternative agent should be used for repeat antibiotic prophylaxis unless antibiotic sensitivities are available for the additional case (see Recommendation 4: Indications for antibiotic prophylaxis)

Evidence Grade D

10.2 Management of clusters in an educational or residential setting

If 2 or more cases of confirmed/probable IMD occur within 28 days in an educational or residential setting, the following should be considered:

1. Do the cases fulfil the definition of a cluster? Cases are more likely to be linked if a common social network can be identified, with a close geographical and temporal relationship.
2. Are the infecting strains indistinguishable?
    - most clusters are likely to be caused the same strain that is circulating in the local community, even when there are no geographical or temporal links identified between cases. Consequently, identification of indistinguishingible strains in a cluster may not necessarily constitute an outbreak, especially if there are no identified epidemiological links between the cases
    - clear differences between strains can, however, rule out an outbreak
    - because of the need for speed, public health action may need to be initiated before full strain characterisation is available, especially if a common social network can be identified
3. Is there a clearly identifiable group at increased risk of IMD that may be benefit from public health action such as wider antibiotic prophylaxis and or vaccination?

Evidence suggests that increased risk of a second case arising in an educational setting following the first case persists for up to around 3 weeks (7). Cases arising more than 30 days apart in an educational setting are most likely to be due to different capsular groups or strains of the meningococcus and, therefore, unrelated. Thus where intervals exceed the 28-day cluster definition, it is more than likely to represent 2 separate introductions into the population or indicate that circulation of that particular meningococcal strain is occurring more widely in the local community. It is known, however, that MenB carriage can persist over a prolonged period. Where strain characterisation of 2 or more IMD cases suggests an identical strain and the cases are linked through a distinct social network or other clearly defined network, therefore, further action may be considered by an incident management team (IMT) even when a period exceeding 28 days has elapsed between cases (100).

These considerations should be discussed by an IMT and will inform the choice of public health interventions that should be undertaken:

- antibiotic prophylaxis leads to short-term meningococcal clearance and, therefore, offers the greatest benefit if given as soon as possible after a cluster is defined and the risk group is identified
- vaccination provides longer-term direct protection to individuals in clusters. Conjugate vaccines (MenC, MenACWY) can also interrupt transmission of the respective serogroups within a network; the current MenB vaccines, which are protein-based, do not have any impact on carriage (101)

Important note: Irrespective of whether the cases in a cluster are linked or not, early dissemination of information should be undertaken to raise awareness of signs and symptoms of IMD because of the importance of being informed and seeking early medical advice if symptoms arise (template letters are available to download).

Different educational settings are considered; pre-schools, primary schools, secondary schools and universities. Residential setting includes, for example military barracks, asylum centres, nursing or residential homes. If indicated, vaccination of contacts in the educational or residential setting should be offered as early as possible because the attack rates are much higher within the first week after the index case is diagnosed.

It may be possible to identify a clearly defined social network where further intervention could be beneficial. If there is no clear group at increased risk of disease, identifying a potential group to be vaccinated becomes difficult. In the absence of a closed or semi-closed network, wider chemoprophylaxis is also unlikely to be beneficial because chemoprophylaxis provides short-term clearance of the nasopharynx but the bacteria can be reintroduced into the network from those outside the network as soon as protection from chemoprophylaxis declines. Decisions related to public health action in such circumstances should generally be made by experienced members of the health protection team or by the IMT.

Protective immune response after conjugate vaccines (MenC or MenACWY) is usually rapid, typically within a week after a single dose of vaccine. Conjugate vaccines also prevent acquisition of carriage, which may help control the spread of infection within the local setting. On the other hand, not all MenB strains in the UK are predicted to be preventable by 4CMenB (Bexsero®) or rLP2086 (Trumenba®) and at least 2 doses are required for protection (4). Additionally, 4CMenB (Bexsero®) and rLP2086 (Trumenba®) do not reduce carriage – this needs to be taken into consideration when assessing the potential benefit of vaccination to control clusters and outbreaks.

Recommendation 11: Managing clusters in educational and residential institutions

Expert advice is available for managing clusters from:

- UK Health Security Agency, Colindale, telephone: 020 8200 4400
- AWARe (all Wales Acute Response team) telephone: 0300 00 300 32
- Public Health Scotland, telephone: 0141 300 1100
- Northern Ireland Public Health Agency Health Protection Duty Room (telephone 0300 555 0119) and out-of-hours on 028 90404090 (ambulance control) and request to speak with the public health specialist on call

Please alert the appropriate organisation to any cluster situation.

Assess the information

When 2 or more cases are reported in an educational or residential setting, careful and rapid assessment should be made. This should include a review of:

- clinical features of the cases
- microbiological data (serogroup and sequence-based typing)
- dates of onset of illness and of last attendance
- links between cases by age, school year, home address, social activities, and friends
- the type of setting (pre-school, primary school, secondary school or university)
- numbers of students in the school and in each school year

Consider the public health management options

The usual course of action should include dissemination of information to raise awareness of symptoms and signs of IMD because of the need for early medical intervention. Information should be distributed widely using all available platforms to parents and students, as appropriate (template letters are available to download).

Evidence grade D

The main decision to be taken by an IMT is whether a high-risk group can be identified that might benefit from public health action, including antibiotic prophylaxis and vaccination to reduce that risk.

The target group should be a discrete group that contains the cases and makes sense to staff, parents or students. For example, children and staff of the same preschool group, children of the same school year, children or students who share a common social activity, or a group of friends. The evidence on risk indicates a need to act promptly with the agreed public health action to prevent additional cases.

Evidence grade D

Make a decision on antibiotic prophylaxis

For clusters in an educational or residential setting, if a clear high-risk group can be defined that contains the cases, antibiotic prophylaxis should be offered to that group. If a subgroup cannot be defined, then a decision may be needed on offering prophylaxis to the whole institution. This will depend on factors, for example, such as the size of the population, the time interval and age difference between cases, whether the cases are confirmed or not.

For clusters among children at pre-school groups and primary schools, both children and staff should normally be included in the group offered chemoprophylaxis and vaccination (some evidence of increased risk) but not in clusters among students at secondary schools, colleges, or universities (no evidence of increased risk).

Where ciprofloxacin is recommended, patient group directions by UKHSA and Public Health Scoltand, may be helpful.

Evidence grade D

Make a decision on vaccination

Template patient group directions by UKHSA and Public Health Scotland (MenACWY and MenB vaccines) are available for meningococcal vaccines.

For a cluster involving confirmed serogroup A, C, W or Y cases: the MenACWY conjugate vaccine should be offered to all individuals of any age who were offered antibiotics unless they are confirmed to have been immunised against the relevant meningococcal serogroup within the preceding 12 months. In the case of a MenC outbreak, another MenC-containing conjugate vaccine (for example Menitorix®, NeisVac®, MenQuadfi) would be a suitable alternative.

Evidence grade D

For a cluster involving confirmed MenB cases: vaccination against MenB should be considered and would usually be offered to the same group that would receive antibiotic chemoprophylaxis as soon as practically possible based on the schedule table below. However, vaccination should target those in the group identified as potentially being at **ongoing** increased risk of disease; for example, if there are 2 MenB cases in a nursery, then nursery contacts may be offered MenB vaccination, but the household contacts of each case would not be considered as have ongoing increased risk.

Evidence grade D

Choice of MenB vaccine

Two vaccines are licensed against MenB; 4CMenB (Bexsero®) and rLP2086 (Trumenba®). The vaccination dosing and schedule for 4CMenB (Bexsero®), as well as the licensed age

indication, is in general more suitable for outbreak control than rLP2086 (Trumenba®). 4CMenB (Bexsero®) also has proven efficacy in the field. Therefore, until more data become available, 4CMenB (Bexsero®) is the vaccine of choice **unless**:

- there is a case with complete 4CMenB (Bexsero®) vaccination (3 doses) thus indicating the strain is more likely to not be covered by 4CMenB (Bexsero®)

or:

- where the outbreak strain is predicted not to be prevented by 4CMenB (Bexsero®) using for example, MATS (if isolates or assay are available, or gMATS/MenDeVar (if a sequence-based approach is used))

Where additional testing is required, results may not be timely and should not delay public health decisions. Please discuss with the UKHSA Meningococcal Reference Unit or, in Scotland, Public Health Scotland.

Where 4CMenB (Bexsero®) is recommended in an outbreak situation; the 2 doses should be offered with a 4-week interval for those aged one year and older because of the need for early protection which, in these circumstances, would outweigh the need for longer-term protection.

It is important to emphasise to vaccinees or parents of vaccinees that the vaccine will only start protecting around 2 weeks after the second dose and, therefore, they should remain vigilant for symptoms and signs of meningococcal disease. Additionally, if 4CMenB (Bexsero®) is administered without confirmation of potential strain coverage by the vaccine, vaccinees/ parents of vaccinees should be made aware that the vaccine may not protect against the circulating strain even after 2 doses.

Evidence grade D

In a cluster or outbreak situation, the cases of serogroups A, B, C, W and Y IMD should also be vaccinated as part of the social network when the cluster/outbreak is declared, unless they have received the vaccine in the previous 12 months.

Evidence grade D

In line with Recommendation 7, in a cluster situation, vaccine is not indicated for those who received chemoprophylaxis for transient contact in dispersal settings as they would not usually be considered to have ongoing increased risk.

Evidence grade D

Table of 4CMenB (Bexsero®) vaccination schedule for MenB cases and contacts

Age	4CMenB (Bexsero®) Vaccination Status	Schedule for secondary prevention of MenB disease
Under 8 weeks	Unvaccinated	Vaccinate in accordance with routine vaccination schedule at the appropriate ages
At least 8 weeks and less than 1 year old	Unvaccinated	Give 2 doses 8 weeks apart with a booster at 1 year of age at least 4 weeks after the last 4CMenB (Bexsero®) dose
Less than 1 year old	Vaccinated	Ensure up to date with nationally recommended immunisation schedule. Continue and complete.
1 year and older	Completed course (2 doses under 1 year and a third dose on or after first birthday, **or** 2 doses after first birthday) and: where the most recent dose was **more than** 12 months ago	Single dose of 4CMenB (Bexsero®) to boost immunity.
	Completed course (2 doses under 1 year and a third dose on or after first birthday, **or** 2 doses after first birthday) and: where the most recent dose was **less than** 12 months ago	No additional vaccination
	Received an incomplete course (see above for definition of complete course) and: the most recent dose was at least 4 weeks ago	Single dose of 4CMenB (Bexsero®) to complete the schedule
	Received one 4CMen B dose in the last 4 weeks	Single 4CMenB (Bexsero®) doses after 4 weeks to complete the schedule
	Not received any prior doses of 4CMenB (Bexsero®) vaccine	Give 2 4CMenB (Bexsero®) doses 4 weeks apart [note 1]

[note 1] There is no accelerated immunisation schedule for 4CMenB (Bexsero®) but the interval between doses for 1 to 10 year olds should be reduced to 4 weeks for secondary prevention of MenB disease because of the need for rapid protection.

Evidence grade D

Use of rLP2086 (Trumenba®) vaccine in outbreaks

When there is a fully 4CMenB (Bexsero®) vaccinated case in a child younger than 5 years of age, irrespective of strain coverage or where the typing profile indicates its unlikely to be covered by Bexsero, then rLP2086 (Trumenba®) at the following schedule is recommended, after discussion with the UKHSA MRU or, in Scotland, Public Health Scotland:

- anyone aged one year or over should receive 2 doses of rLP2086 (Trumenba®) at least 4 weeks apart (irrespective of prior 4CMenB (Bexsero®)), with the first dose given as soon as possible – this is to ensure early and rapid protection against IMD and, as such, the third dose of rLP2086 (Trumenba®) at 6 months is not required
- in children aged one year to less than 2 years, any outstanding 4CMenB (Bexsero®) doses, as recommended according to the national immunisation schedule, should be given at least 4 weeks after the second additional rLP2086 (Trumenba®) dose administered as part of the outbreak response
- although rLP2086 (Trumenba®) is unlicensed in children aged 1 to 9 years, studies have shown the vaccine is safe and immunogenic in this age group
- infants aged 11 months until their first birthday should receive an extra dose of 4CMenB (Bexsero®) immediately as part of the outbreak management if they have not had a dose in the previous 4 weeks – they can then be given 2 doses of rLP2086 (Trumenba®) at least 4 weeks apart from their first birthday and at least 4 weeks after their last 4CMenB (Bexsero®) dose
- infants under 11 months should receive an extra dose of 4CMenB (Bexsero®) if they have not had a dose in the previous 4 weeks (rLP2086 (Trumenba®) has not been used in infants under 1 year of age) – this extra dose should be considered additional to the nationally recommended 2+1 schedule at 8 weeks, 16 weeks and 1 year of age. Any further 4CMenB (Bexsero®) doses as recommended according to the national immunisation schedule should be given at least 4 weeks after the additional 4CMenB (Bexsero®) dose given as part of the outbreak response. Maximising 4CMenB (Bexsero®)-induced antibodies with an additional vaccine dose should provide the infant with some additional cross-protection against IMD in the context of an outbreak

rLP2086 (Trumenba®) is not currently included in the national childhood programme and it may be problematic to purchase a timely supply (see Emergency vaccine supply for use in an outbreak situation). If rLP2086 (Trumenba®) is indicated but cannot be made available within 2 weeks of antibiotics chemoprophylaxis administration, then 4CMenB (Bexsero®) should be used according to the 4CMenB (Bexsero®) recommended outbreak schedule. This is expected to provide additional cross-protection during the outbreak period.

For a cluster involving 2 or more “probable” cases: every attempt should be made to determine the meningococcal capsular group for at least one case before any decision to offer vaccination is made. If this is not possible, then a vaccine with broad coverage such as 4CMenB

(Bexsero®) or rLP2086 (Trumenba®) may be considered as these vaccines may also help protect against other capsular groups.

If antibiotics and/or vaccine are to be offered, make urgent arrangements in line with local procedures with:

- community medical or nursing staff to deliver medicines, vaccine or information
- head of the institution to inform parents/students and seek consent
- pharmacists to supply antibiotics (in correct formulation, dosage and information sheets) and vaccines (102)

Important note: Closing the school is not advised as no reduction in risk would be expected (levels of contact among social networks are unlikely to be reduced and may increase with school closure; also, application and success of public health actions will be assisted if school attendance is high).

Swabbing to measure carriage of outbreak strains is not usually recommended in acute outbreaks because decisions have to be taken before results are available and because carriage rates often bear no relationship to risk of further cases.

Important note: If 2 or more cases occur within a clearly defined social group outside an educational setting, the same principles as for a school cluster apply.

Recording of antibiotic and vaccine administration

When antibiotics are prescribed or vaccinations given outside general practice in an outbreak setting, the GP practice of each recipient of antibiotic prophylaxis and vaccination (with batch and product information) should be informed so that an up-to-date medical record can be retained for their registered patient.

Emergency vaccine supply for use in an outbreak situation

In England and Wales, if there is no vaccine stock available from the manufacturers or if there is any delay, then discuss with colleagues in the Immunisation Division at UKHSA Colindale or email vaccinesupply@ukhsa.gov.uk for advice.

In Scotland, vaccine supply should be obtained from local hospital pharmacy departments.

Vaccine supply for use in clusters in Northern Ireland should be discussed with the Public Health Agency Health Protection Duty Room 0300 555 0119 or out of hours on 028 90404090 by requesting to speak with the public health specialist on call.

Linked cases that do not meet the cluster definition (see top of section 10.2)

In such circumstances, a broad ‘warn and inform’ approach would be indicated. Public health action following linked cases that are not considered to meet the cluster definition (for example, 2 students at the same university with no common social links identified) will need to be decided based on the specific circumstances.

10.3 Vaccination in pregnancy

In the context of an outbreak, chemoprophylaxis is recommended in close contacts who are pregnant to reduce their immediate risk of invasive disease. MenACWY conjugate vaccination is also recommended to close contacts of cases with these 4 serogroups (A, C, W, Y), including those who are pregnant, given their low reactogenicity.

MenB vaccination is not advised for close contacts who are pregnant in an outbreak setting because of the lack of data on administration of licensed MenB vaccines during pregnancy and their known reactogenicity profile which includes pyrexia. For those who are pregnant and in a high risk group (such as asplenia or on treatment inhibiting complement activation, such as eculizumab, ravulizumab, or zilucoplan) specialist advice must be sought.

10.4 Management of clusters in the wider community

One of the major difficulties in targeting a wider community for intervention is deciding on the population boundaries, often defined by age group and geography. Such boundaries will of necessity be arbitrary. As far as possible, use existing administrative boundaries that make sense to the people who live within and without them. In any case, there are likely to be people living on the other side of the boundary who may feel unjustifiably excluded. The extent of public concern and press interest can be extensive. There have been examples of extended clusters of disease within socially-related groups over a poorly defined geographical area. Such clusters may be difficult to define as there may be more than one link by recreational activity (for example, sports club) or through regular social groups. In a university setting where cases are not limited to a well-defined student population or student residence, for example, it may be more helpful to consider the university in the context of a community setting.

Although school outbreaks must be handled quickly in order to control alarm and reduce immediate risk of further cases, wider community outbreaks usually build up more slowly and by their nature are more diffuse. The same principles and management steps apply (see recommendations 11, 12 and 13).

In such situations, age-specific attack rates should be calculated.

10.4.1 Calculating age-specific attack rates

The numerator would be the number of confirmed cases in the population at risk caused by strains of the same capsular group and that are not distinguishable by standard molecular typing. Multiple cases in the same household or in the same institutional setting would be considered (if this setting is considered to be the focus of a separate outbreak) as a single case. The denominator would be the population at risk, which must be clearly defined if meningococcal vaccination is to be offered, and make sense to the people who live within and outside the selected boundaries (for example a rural town or village, a secondary school with its feeder schools). It may not be easy to define such a population. If the outbreak is mainly in children, the denominator should be based on the age range of children at risk (for example, 2 to 4 year olds, 2 to 16 year olds) in whom the vaccine should be effective.

Vaccine should only be considered if the age-specific attack rate (number of confirmed cases due to the outbreak strain [suggested minimum of 4] divided by the number in target age-group) in a 3-month period is ‘high’. Although a precise threshold for intervention has not been set, age-specific attack rates among 2 to 16 year olds targeted for intervention in 2 community outbreaks during the winter of 1995 and 1996 caused by MenC were greater than 40 per 100,000.

Recommendation 12: Managing clusters in the wider community

Any decision to offer meningococcal vaccines to wider communities will require careful assessment of all the available epidemiological information, such as the number of confirmed and probable cases, molecular information on infecting meningococcal strains, dates of onset, links between cases, size of the community, and routine vaccination uptake rates.

Evidence grade D

Vaccination against clusters caused by the same serogroup of IMD may be considered in the community if the age-specific attack-rate (for a vaccine preventable strain in the case of MenB) within a defined geographical boundary over a 3 month period exceeds 40 per 100,000.

10.5 Disseminating information in cluster management

It is essential that clear, consistent and accurate information is provided to parents, students and staff, and the wider community. The target group should be clearly identified and information to this group should emphasise the importance of early recognition of symptoms and prompt access to medical services (template letters are avaible to download).

Local general practitioners and out-of-hours services should be advised to be on the alert for any new cases associated with the cluster. It may also be helpful to alert receiving Accident and Emergency departments and admitting clinicians.

As far as possible, information that may need to be disseminated should be prepared in advance. In pre-school and school settings an experienced member of the health protection team should liaise closely with the manager or head teacher. In college or university settings liaison will usually be with a member of the senior management team (see higher education institution guidance) and representation from the educational setting would usually be invited to join the IMT. It is advisable for one person within the college/university to coordinate operations, and to receive and disseminate all information. Registry departments can aid in tracing students and getting information to them, and personnel or occupational health departments can help disseminate information to staff groups. In Wales there are institution-specific contingency plans for educational settings available to the AWARe team and Out Of Hours teams.

A communication strategy will be required. If high levels of interest are anticipated or already evident, consider; telephone helplines (see Focus 3 for helpline contact details), allowing controlled media access to vaccination sites, and regular coordinated press briefings and to hold press conferences (83).

Focus 3. Helplines and leaflets

Meningitis charities and NHS111, NHS 24, NHSInform

The meningitis charities may be contacted when there is a case of meningococcal disease. They need to have sufficient information so that they can support callers with appropriate advice. The information given to these bodies should include anonymised details of the case and of public health action taken.

NHS inform is Scotland's national health information service Scottish health information you can trust | NHS inform.

Leaflets and posters available from Health and Social Care Publications orderline

Ordering from the Health and social care order line for England is easy and the service is free of charge. Anyone can register for an account. Once you have registered you will then be allocated an account and can place orders. You will need your full postal address and an email address.

In Scotland, if you wish to order vaccine leaflets or posters, please contact your local Health Board Resources Officer who can place an order via the online portal. Vaccine leaflets can also be ordered directly from Public Health Scotland by emailing phs.generalpublications@phs.scot

Meningitis Research Foundation

For enquiries and to request resources: 080 8800 3344 (UK) or 1800 41 33 44 (Republic of Ireland)

Helplines

Meningitis Now nurse-led Helpline 0808 80 10 388 (Freephone) email: helpline@meningitisnow.org and on social media Facebook @meningitis_now

Leaflets and posters can be ordered or downloaded from the website or by calling the Meningitis Now office.

Meningitis Research Foundation 0808 800 3344 in the UK (Freefone), 9am to 5pm Monday to Friday. One-to-one advice and support is available on the phone and via online chat, email and social media: meningitis.org/get-support/get-support.

Help and support resources can be accessed at any time at meningitis.org/get-support/help-and-support-resources.

- NHS 111 (England)
- NHS 24 (Scotland) Dial 111
- NHS Direct Wales 0845 46 47

Websites

- Meningitis Research Foundation
- Meningitis Now
- Meningitis on NHS.UK
- Meningococcal disease (UKHSA)
- Public Health Agency, Northern Ireland
- Meningococcal disease, Public Health Scotland
- Scotland NHS Inform
- Immunisation Scotland
- Meningococcal disease, Public Health Wales
- Meningococcal green book chapter 22

11. Appendix 1

Table 1. Levels of evidence (35)

1++	High quality meta analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias.
1+	Well conducted meta analyses, systematic reviews of RCTs, or RCTs with a low risk of bias.
1-	Meta analyses, systematic reviews of RCTs, or RCTs with a high risk of bias.
2++	High quality systematic reviews of case-control or cohort studies. High quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal.
2+	Well conducted case control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal.
2-	Case control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal.
3	Non-analytic studies, for example case reports, case series.
4	Expert opinion.

Table 2. Grades of recommendation

A	At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; or a systematic review of RCTs or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results.
B	A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 1++ or 1+.
C	A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 2++.
D	Evidence level 3 or 4; or extrapolated evidence from studies rated as 2+.

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Prepared by: Helen Campbell, Mary Ramsay and Shamez Ladhani of the UKHSA Immunisation Division together with Ray Borrow of the UKHSA Meningococcal Reference Unit, NHS National Services Scotland, Public Health Wales and Public Health Agency in Northern Ireland. We are grateful for the additional contributions made by the UKHSA Vaccine Preventable Invasive Bacterial Infections Forum and UKHSA Health Protection Teams in particular Surrey and Sussex Health Protection Unit and North East Health Protection Team.

For queries relating to this document, please contact:

Shamez Ladhani
Immunisation and Vaccine-Preventable Diseases Division
UKHSA Colindale
61 Colindale Avenue
Colindale
London NW9 5EQ
Email: shamez.ladhani@ukhsa.gov.uk

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