Preventing secondary meningococcal disease in health care workers: recommendations of a working group of the PHLS Meningococcus Forum

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Summary: *Based on new data on the risk of secondary meningococcal disease in health care workers, a review of published cases and an assessment of the available evidence, a change to the recommendations for giving chemoprophylaxis to health care workers in England and Wales is proposed. Previous guidance recommended prophylaxis only for those who had given mouth to mouth resuscitation. Chemoprophylaxis is now recommended for health care workers whose mouth or nose has been directly and heavily exposed to respiratory droplets/secretions from a case of meningococcal disease around the time of hospital admission. Wearing surgical face masks is encouraged to reduce risk of exposure.*

Key words:
meningococcal disease
healthcare workers
respiratory droplets
face masks
chemoprophlaxis

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Introduction

Recommendations on prophylaxis for health care workers exposed to cases of meningococcal disease vary between countries and reflect uncertainty about the degree of risk. In North America and Australia, antibiotics are recommended for health care workers after exposure to oral or nasopharyngeal secretions of a case, for example during airway management procedures such as endotracheal intubation[1-5]. In the UK chemoprophylaxis has been recommended for a more restricted group: those who have carried out mouth to mouth resuscitation[6,7]. A BMJ editorial in October 1999 called for a broadening of the indications for prophylaxis to include those undertaking airway management procedures[8].

Invasive meningococcal disease has a high fatality rate. Even minimal contact between cases and health care workers may raise concerns about transmission of infection and result in requests for prophylactic antibiotics. A survey of occupational health departments in England in 1997 found that 12% of responders would recommend antibiotics to health care workers after general nursing contact (Ian Blair, personal communication).

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Risk assessment

A study in England and Wales found that health care workers in close contact with patients suffering from meningococcal disease were at increased relative risk of disease in the ten day period after exposure, although absolute risks remained very low (9). A total of three cases of meningococcal disease in health care workers following recent contact with a primary case were identified during a 15 year period[9], and all had spent at least 30 minutes with the primary case around the time of admission. Two of the health care workers had undertaken procedures that would have resulted in direct exposure to respiratory droplets from the patient (airway insertion whilst patient having a seizure, patient coughed during fundoscopy). None had worn masks or taken prophylactic antibiotics. Microbiological data was insufficient to prove secondary infection but the

timing of the cases, the level of exposure, and the statistical significance of the relative risk estimates (p=0.0003) suggested a causal link.

The absolute risk in health care worker contacts ($0.8/10^5$) and their risk relative to the population at large (25-fold higher) were both small compared with the corresponding risks in studies of household contacts ($210/10^5$ and 500 to 1 200-fold higher respectively)[10-12]. Nonetheless the data were consistent with a risk from unprotected airway exposure to nasopharyngeal secretions of patients around the time of admission to hospital. Given that *Neisseria meningitidis* is transmitted by respiratory droplets and that the invasive strain can be isolated from the nasopharynx of more than 40% of cases when admitted to hospital[13,14], some increased risk of transmission (and consequent disease) is not unexpected.

A Medline search identified few other reports of secondary cases in health care workers[9], but the pattern of exposure was similar to that in the above cases. Meningococcal meningitis developed in a nurse assisting during intubation and suction of nasopharyngeal secretions from a patient with meningococcal disease[15]. Meningococcal septicaemia developed in a physician who performed endotracheal intubation on a child with meningococcal meningitis[16]. In a nosocomial outbreak involving a primary case with meningococcal pneumonia in whom respiratory isolation was delayed, a nurse died of meningococcaemia[17]. Two cases of meningococcal disease in health care workers[18] and one of carriage[19] following mouth to mouth resuscitation on cases, have also been reported.

Chemoprophylaxis: benefits and costs

Evidence of the effectiveness of chemoprophylaxis in preventing secondary cases in household contacts is supportive but inconclusive[10, 12]. In the household setting, source(s) of infection and time of transmission are unknown. On the basis that the infection is usually acquired from close contacts who carry the disease-causing strain, antibiotics are given to eliminate carriage from these contacts. The aim is to prevent the spread of meningococci to individuals within the close social network, some of whom may be susceptible to invasive disease. The rationale for giving antibiotics to health care workers is different. The time of exposure can be clearly identified, and antibiotics that eliminate carriage given soon after that exposure would be expected, not just to eliminate carriage, but also to prevent potential development of disease in treated individuals. Although no studies have assessed the effectiveness of chemoprophylaxis in this situation, there is good evidence that some antibiotics are highly effective in eliminating nasopharyngeal carriage[20-23].

There are costs other than financial in giving antibiotics. These include drug adverse effects, promotion of antibiotic resistance and eradication of carriage of non-pathogenic Neisseria species that generate cross-protective immunity against invasive disease[24-26].

Infectivity: time, distance and route

Neisseria meningitidis is transmitted from person to person through nasopharyngeal secretions or large particle respiratory droplets that are unlikely to remain airborne beyond a distance of one metre (3ft)[27]. The organism dies quickly outside the host. Exposure to meningococci may be followed by colonisation and development of immunity, or, much more rarely, the development of invasive disease. After starting treatment with intravenous benzylpenicillin, carriage rates decrease rapidly so that meningococci are undetectable by nasopharyngeal swabbing after 24 hours on treatment[13]. Penicillin should substantially reduce infective risk, during treatment but does not eradicate carriage[13]. Third generation cephalosporin antibiotics, such as ceftriaxone, would be expected to have a similar or more rapid effect on suppression of carriage but, in contrast to penicillin, ceftriaxone also eradicates meningococcal carriage. Hence rifampicin is recommended for cases not treated with ceftriaxone before discharge from hospital[6,13].

Meningococcal conjunctivitis is rare but occasionally presages invasive disease[28]. We did not find any reports of secondary meningococcal conjunctivitis in health care workers.

Masks

A standard text on control of infection in the UK does not advocate wearing surgical masks because of their doubtful value in protecting against the airborne spread of organisms[29], but recently published guide-

TABLE 1 The grading of level of evidence

Level	Types of evidence
Ia	Evidence obtained from meta-analysis of randomised controlled trials
Ib	Evidence obtained from at least one randomised controlled trial
IIa	Evidence obtained from at least one well-designed controlled trial without randomisation
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study
III	Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case control studies
IV	Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities
WP	Opinion of this working party

lines for preventing hospital acquired infections recommend wearing face masks and eye protection when there is a risk of secretions splashing into face and eyes[30]. In the USA, masks are recommended when working within three feet of patients known, or suspected, to be infected with micro-organisms transmitted by large-particle droplets (>5 micrometres diameter) that can be generated during coughing, sneezing, talking or the performance of clinical procedures[27]. Laboratory studies suggest that surgical masks can protect the wearer against droplet transmission[31,32]. Further evidence to evaluate the role of masks in protecting staff against such infections is needed.

Recommendations

It should be noted that this guidance only applies to exposure from patients in a clinical setting and not to exposure in other settings eg from isolates in a laboratory. The evidence supporting these recommendations and the recommendations themselves have been graded using the criteria in tables 1 and 2[33].

1. Chemoprophylaxis is recommended only for those health care workers whose mouth or nose is directly exposed to infectious respiratory droplets/secretions within a distance of 3ft from a probable or confirmed case[34] of meningococcal disease (table 2, C). This type of exposure is most likely to occur in staff who undertake airway management during resuscitation without wearing a mask or other mechanical protection (table 1, IV). In most cases this would imply a clear perception of physical contact with droplets/secretions. Droplets and facial secretions are considered to be infectious from the onset of the acute illness until completion of 24 hours treatment with systemic antibiotics (III). Oral antibiotics such as rifampicin 600mg twice daily for 2 days or ciprofloxacin 500mg as a single dose[6] are recommended for prophylaxis (C).
2. Chemoprophylaxis is not recommended without a clear history of such exposure (table 2, C). General medical or nursing care of cases should not be regarded as an indication for giving prophylaxis.
3. Exposure of the eyes to respiratory droplets is not considered an indication for prophylaxis (table 2, C). Such exposure may however carry a low risk of meningococcal conjunctivitis and subsequent invasive disease (table 1, III). Staff should be counseled about this risk and advised to seek early treatment if conjunctivitis should develop within 10 days of exposure (table 2, C).
4. Health care workers should be encouraged to wear masks when carrying out procedures which may result in exposure to infectious respiratory droplets (see recommendation 1) (table 2, C).
5. Staff working in specialist intensive care units may be at risk of frequent exposure. Reducing the possibility of exposure to large droplets (eg wearing masks, using closed suction) and assessing the risk after any exposure are suggested measures to reduce the need for chemoprophylaxis (table 2, C).
6. Routine vaccination of health care workers with meningococcal C conjugate vaccines is not recommended for two reasons (table 2, C). First, at the time of exposure, the serogroup of the infecting strain is not usually known, so previous vaccination would not obviate the need for chemoprophylaxis. Second, as the UK vaccination programme takes effect, the incidence of serogroup C disease and the proportion of cases caused by such strains should diminish, thus reducing risk of secondary cases that are vaccine preventable.

TABLE 2 The grading of recommendations

Grade	Recommendations
A (evidence levels Ia and Ib)	Requires at least one randomised controlled trial as part of the body of literature of overall good quality and consistency addressing the specific recommendation
B (evidence levels IIa, IIb and III)	Requires availability of well-conducted clinical studies but no randomized trials on the topic of recommendation
C (evidence level IV)	Requires evidence from expert committee reports or opinions and/or clinical experience of respected authorities (including the current working party). Includes absence of directly applicable studies of good quality
WP	Opinion of this working party in the absence of other grading level criteria
	Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case control studies
IV	Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities
WP	Opinion of this working party

Implementation of recommendations

NHS trusts have a duty of care to their employees. They are responsible for identifying microbiological hazards, taking steps to protect health care workers and ensuring access to occupational health advice[35, 36]. At the same time employees have a duty to comply with trust policies[35]. Control of infection teams would be expected to work with units where suspected cases of meningococcal disease are assessed and resuscitated (eg intensive care units, accident and emergency departments) to develop safe working practice. Arrangements for risk assessment and prophylactic treatment should be available within 12 hours of exposure to potentially infected secretions (table 1, WP). Risk assessment is normally the responsibility of the occupational health department in conjunction with the infection control team.

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Footnote

At the time of writing these guidelines JMS, JSK, EBK and PM were members of the Public Health Laboratory Service Meningococcus Forum. The Public Health Medicine Environmental Group was represented by PM and WP, the Association of National Health Occupational Physicians by AR, the Infection Control Nurses Association by SM, and the Institution of Occupational Safety and Health (Heathcare Specialist Group) by PK.

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