Managing meningococcal disease case clusters: art or science?

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The epidemiology of meningococcal disease in England and Wales has been subject to regular periodic review and comment. Seasonal and period trends in incidence based upon laboratory confirmed reports and official notifications have been documented for all meningococcal disease and for major serogroups and sub-types. The disease is noted to be commoner in the winter months and among younger age groups, particularly children under two years of age. Since the latter period of the past decade case ascertainment for meningococcal disease has increased. This is believed in part to be attributable to improved notification procedures and reporting practices, particularly in some regions where improved surveillance of meningococcal disease has been undertaken in recent years. However, some increase in incidence seems likely as the number of reported deaths from meningococcal disease have increased despite a fall in the case fatality rate. There has also been a change in the epidemiology of meningococcal disease during the past five years in the UK and elsewhere with an increase in the proportion of Group C strains and a corresponding decrease in the proportion of cases caused by Group B. This change in the proportion of B and C strains causing disease has been accompanied by an upward shift in the age distribution of cases with a greater proportion now occurring in older age groups.

However, the most significant effect on the public health management of meningococcal disease as a result of these changes in the epidemiology has been attributable to the more frequent occurrence of case clusters. Family, nursery, school, university and other institutional case clusters have been reported. Guidelines for the management of such meningococcal case clusters in the UK have been developed for Consultants in Communicable Disease Control (CseCDC) by the Public Health Laboratory Service (PHLS) and Public Health Medicine Environmental Group (PHMEG) Meningococcus Working Group. The guidelines advise that chemoprophylaxis should be considered if two or more probable or confirmed cases occur at the same time within a period of one month and that in addition that vaccination with meningococcal A/C vaccine should be offered if a vaccine preventable strain is confirmed. The average number of cases in each cluster is small (median 2–5) and the occurrence of clusters remains relatively uncommon, but management may be problematic. We describe two case clusters of meningococcal disease in Liverpool that occurred during the winter of 1998 illustrating some of the practical dilemmas that may be encountered in the management of such case clusters.

Description of case clusters

CLUSTER 1: CASE 1

Monday 22 December 1997: A 14 year old girl was admitted to the regional children’s hospital with severe meningococcal septicaemia. This was subsequently confirmed to be caused by Group C 2a non-typable. In accordance with local policy and national guidelines household equivalent contacts were identified and offered chemoprophylaxis and meningococcal A/C vaccine. It was noted that the girl attended a local school (school A) from which she had been absent since 19 December.

Tuesday 23 December 1997: The head teacher was informed of the case. The school closed for the Christmas holidays on 23 December.

Friday 26 December 1997: Despite intensive medical care the patient died. The death attracted some media interest: a local newspaper reported the death and quoted advice from the acting Consultant in Communicable Disease Control (CCDC) concerning the symptoms and signs of meningococcal disease and the appropriate action to be taken by members of the public.

CLUSTER 1: CASE 2

Monday 5 January 1998: The on call public doctor (KA) was notified by telephone during the evening that a second pupil who attended school A, a 15 year old patient, had been admitted to the intensive care unit of the regional children’s hospital with severe meningococcal septicaemia. This second patient had been on holiday in north Wales between 31 December to 3 January. Her clinical condition was reported as critical. Household equivalent contacts, including the people who had shared a chalet with her on holiday, were identified and offered chemoprophylaxis. It was established from her parents that she was neither a friend nor classmate of the first case and had no contact before becoming ill. It was also noted that the school had been closed for the Christmas holiday during the incubation period for case 2. The CCDC (CMR) was informed of the second case and possible case cluster.

That evening a popular medical drama series was screening an episode depicting a community outbreak of meningococcal disease that was considered by us to contain incorrect information concerning the disease and its management. The Public Health team recognised that the occurrence of the second case among pupils attending the same school...
coupled with the television drama was likely to lead to high parental anxiety despite the obvious lack of association.

**Tuesday 6 January 1998:** An informal outbreak team met that morning, chaired by the CCDC, to review the evidence and agree on the nature of the incident. Advice was sought from the PHLS Meningococcal Reference Laboratory, which confirmed the local view that these were two sporadic community cases and that mass public health action was not indicated.

The CCDC informed the head teacher of the second case and met together with the Chair of the School Governors and Local Education Authority Press Officer to discuss further action. The governors unanimously decided to delay opening the school for Lent term until 9 January. This decision was taken despite a public health recommendation that the school should open as normal on Wednesday 7 January. The governors considered that because of the level of parental concern that the start of term should be deferred until parents had had an opportunity to discuss their concerns with members of the public health team. As a consequence of this decision the school was forced to communicate with parents via local radio and other media. This undoubtedly contributed to parental anxiety and concern. The Local Education Authority issued a press release informing parents of the decision to delay school opening and the proposed meeting with the public health team on the evening of Thursday 8 January. The press release attracted considerable local and regional media interest with brief references on national and international media. The news media were dealt with initially by the CCDC.

**Wednesday 7 January 1998:** The CCDC attended a meeting at the school to brief members of staff on the possible case cluster and meningococcal disease.

**Thursday 8th January 1998:** In the evening, the Public Health team, together with colleagues from Community Paediatrics, the Local Education Authority, the Meningitis Merseyside Support Group and the National Meningitis Trust, attended a very stormy meeting with about 700 parents at the school. Many parents quoting, from the Monday night's episode of the popular medical drama series, demanded vaccination (fig 1). Unfavourable comparisons were made between the action depicted in the fictional setting and the advice being offered about the real life situation by the Public Health team. Some parents walked out of the meeting after being informed that mass chemoprophylaxis and vaccination were not appropriate and would not be offered to pupils attending the school.

**Friday 9 January 1998:** Less than 10% of pupils attended school and the parental boycott received wide local and regional media coverage (fig 2).

A formal incident team meeting chaired by the CCDC was held that afternoon to review the incident and options for further action. It was recognised that there was a need to re-establish contact with parents and to provide reassurance that all necessary and appropriate public health action had been taken. One major concern expressed by parents was that they believed that the school was the setting for transmission of meningococcal bacteria. It was decided to offer nasopharyngeal screening to all pupils to demonstrate that the carriage rate of meningococci in school A's population was not higher than that expected in the Liverpool population as a whole, thus showing that there was no evidence of an increased risk of further cases of meningococcal disease in the pupils compared with the general population.

**Monday 12–Wednesday 14 January 1998:** Screening was carried out at the school and over 90% of pupils were screened. This was conducted by teams from the local Public Health Laboratory, Community Paediatrics and Public Health departments. The opportunity was also taken to provide further information and advice to parents concerning the symptoms and signs of meningococcal disease and to reiterate reassurances on the low risk of further cases at the school. The Director of Public Health (RH) took the lead in managing the media to enable the CCDC to coordinate the screening exercise (fig 3).

**Monday 12th January 1998:** A possible case of meningococcal meningitis was notified who was a pupil at one of the feeder primary schools to school A, which further heightened public concern and lead to allegations by a local newspaper that there was community cluster involving school A and two primary feeder schools in the locality. It was possible to refute this allegation as neither of the possible primary school cases were confirmed by investigation including PCR (polymerised chain reaction) for meningococcal antigens.

**Tuesday 13 January 1998:** The Meningococcal Reference Laboratory confirmed that the group for the second case was C2a.P1.5, which was considered to be phenotypically distinct from the strain isolated from the first case and provided further evidence that the two cases were sporadic and unlinked. Vaccination was offered to household equivalent contacts only.

**Tuesday 20 January 1998:** Results from the mass school screening indicated a carriage rate of 7.4%. The Meningococcal Reference Laboratory advised that these findings supported the public health action taken and that mass chemoprophylaxis and vaccination were not indicated.

The options for public health action were formally considered at a final incident meeting, that afternoon, chaired by the Chief Executive involving the DPH, the CCDC, LEA representative, the Chair of School Governors, the head teacher and the Chair of the Community Health Council. The professional public health advice that no further public health action was appropriate other than the screening exercise was accepted.

Also on this day despite prolonged intensive care case 2 tragically died two weeks after the onset of illness. The head teacher wrote to all parents informing them of the results of the screening process and over the next few weeks
the pupils returned to school and the incident was concluded. No further cases occurred during the subsequent six month period.

CASE CLUSTER 2
Monday 9 February 1998: A school teacher (school B) was admitted to hospital with meningococcal septicaemia. This was confirmed as caused by a group C strain and chemoprophylaxis and vaccination were offered to household equivalent contacts. The head teacher was informed of the case.

Wednesday 11–Friday 13 February 1998: The Public Health Department and the Meningitis Merseyside Support Group met with parents at the school to provide information about meningococcal disease and the approach taken to the management of cases and case clusters of meningococcal disease.

Friday 13 February 1998: A 5 year old child who attended school B was admitted to hospital with meningococcal septicaemia. This was strongly suspected to be a group C strain on the basis of latex antigen testing, and an incident team was convened involving the Public Health Department and the Local Education Authority.

Friday 13–Saturday 14 February 1998: As the school was due to break that day for the half term holiday arrangements were made for chemoprophylaxis to be given to all pupils and staff at school B that evening and also to pupils and staff of school C, which was located on the same site as school B. Chemoprophylaxis was administered to over 700 pupils and 50 members of staff. Confirmation was received on 14 February that the second case was attributable to a group C strain (PCR serogroup C positive). Arrangements were made for meningococcal vaccination to be offered to all pupils and staff at the two schools after the half term holiday. Explanatory letters were prepared and sent out to all parents of pupils.
during the half term break. All local general practitioners were faxed relevant information and telephone helplines were set up at the Health Authority.

Monday 23–Tuesday 24 February 1998: Mass vaccination took place at the school for pupils and staff after the half term break. Ninety eight per cent of children were vaccinated and there were no further cases.

As a postscript, the first case was subsequently confirmed as group C 2a P1.5 and the second case was later confirmed as group C 2b P1.5 1.2. Thus the two cases were in fact sporadic community cases that coincided in time and did not constitute a case cluster.

Discussion
The management of both case clusters was undertaken within the framework of the established national guidelines for such incidents and in consultation with the PHLS Meningococcal Reference Unit, Manchester. The two case clusters provoked very different reactions from parents and the media and required different practical management.

Public concern about meningococcal disease after case cluster 1 was exceptionally high. The response by parents in the first school cluster was understandable particularly when reference is made to the “alert” and “trigger” factors identified by a Department of Health...
Working Group on Risk Perception. Two children had been unexpectedly and unavoidably affected by a serious infectious disease; one child had died and the second was critically ill when news of the case cluster broke. The media played a key part in contributing to the public perception of the case cluster. The medical television drama episode, on the night the second child was admitted to hospital, gave factually incorrect information about meningococcal disease, stating that the incubation period is 14 days. This was exactly the interval...
between the two cases and this statement was repeatedly referred to by parents at the public meeting and seemed to be a major factor for many parents who found it difficult to accept that the two cases were not linked to the school and were in fact sporadic community acquired.

The Liverpool Health Authority, among others, formally complained to the Independent Television Commission (ITC) concerning alleged inaccuracies contained within the television drama and this has been upheld in part by the ITC.

The media were also drawn into the incident after the decision of the school governors to defer the reopening of the school until after a public meeting with parents. As a consequence of this decision the school was forced to communicate with parents via local radio and other media. The delayed opening of the school and subsequent communications via the media seemed to contribute to parental anxiety and concern.

Considerable time had to be devoted by the public health team to managing the media and the extensive public risk perception shadow11 cast by the incident. Considerable effort was also concentrated on correcting misconceptions about value of meningococcal vaccine for sporadic case clusters and the potential to create immunotolerance to the, shortly to be introduced, conjugate group C vaccine by inappropriate and ineffective use of the existing meningococcal A/C vaccine.12

There was much concern among all of the people who had been on the same holiday as case 2 but had not shared a chalet. This was because of a lack of understanding about how the disease is transmitted and the risks of contracting the disease. These other people did not receive chemoprophylaxis, as casual contacts, but did take up a lot of the team's time explaining about the disease, its cause, transmission and risks.

Other groups who took up a lot of the team's time in giving explanations about the disease and the risks were the schools and nurseries of the siblings of the two cases. There was a perceived risk from the siblings because they had received chemoprophylaxis, people therefore thought they must be a risk to their children and wanted them removed from school.

The heightened awareness created by the local media meant that any other suspected cases in school age children led to a fall in school attendance until the incubation period had passed. A more positive benefit was the increase in awareness of meningococcal disease that meant families were more suspicious of the possible diagnosis and therefore sought help earlier. The Public Health Department received notifications earlier than usual from professionals and even a few direct from families.

The case cluster was in every sense a “major incident”11 for the Public Health Department and the Health Authority. This required not only a tactical response by the CCDC to coordinate operational actions and liaise with school, local education authority and media but also strategic involvement of the Director of Public Health and Chief Executive. In comparison the second case cluster occurred during term time. The period between the two cases had been used to fully inform parents, local education authority, school governors, head teacher and staff. Importantly the schools remained open during the incident and this was crucial to maintaining effective communication with parents. When the second case was diagnosed parents were worried but reassured that “everything was being done” and therefore the risk appeared to be minimised. There were some logistic difficulties to overcome in the organisation and administration of chemoprophylaxis in a very short period of time, particularly as it was the Friday before a half term holiday. Proactive arrangements with the Department of Community Paediatrics and pharmacy departments of the regional children’s hospital and community trust had established mechanisms for obtaining appropriate supplies for administering mass chemoprophylaxis and vaccination and for deploying necessary staff. The media were helpful partners in alerting the parents of those children who had been kept off school to bring their children for chemoprophylaxis. The decision to offer chemoprophylaxis and vaccination was based on the close temporal occurrence of the possible further transmission of infection within the school setting. However, subtyping confirmed that the cases were two separate subtypes and therefore not linked. The majority of cases are sporadic but when two occur in proximity to each other it is clear that the public will expect action to be taken. As sub-typing is not available sufficiently quickly to prove a link or not, management of case clusters will depend on being able to use epidemiological skills and allaying parental fears where necessary. This is increasingly difficult when the “incident” has already happened and the value of a proactive communication and information strategy for meningococcal disease is illustrated by comparing and contrasting the two case clusters.

Current national guidelines place emphasis on appropriate management of sporadic case and case clusters of meningococcal disease and dissemination of information to the public in response to the occurrence of cases.9,10 However, there is evidence from experience with previously reported case clusters that public awareness may be associated with improved survival.1 It is also recognised that even if an effective conjugate group C vaccine is introduced in the UK within the next two to three years that public awareness of meningococcal disease and of the appropriate action to take will remain important in reducing the morbidity and mortality from this disease. This suggests that further proactive efforts should be undertaken to raise public awareness about meningococcal disease perhaps as part of a meningococcal prevention and control strategy within a, much needed, Communicable Disease Strategy for England. At a local level we have arranged to meet radio and newspaper editors this summer to plan a shared approach to the dissemination of public information about meningococcal disease.
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