Streptococcus pyogenes cluster in a care home in England April to June 2010

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Two fatal cases of *Streptococcus pyogenes* emm st22.6 bacteraemia occurred in a care home in England during April and June 2010, initiating a cluster investigation. The first case had left the home 13 days before the second case took up residence. We sought further cases and carriers. We swabbed throat and chronic skin lesions from residents and staff and examined these specimens for the presence of *S. pyogenes*. 61 specimens were taken from 18 of 19 residents and 39 of 39 staff. All results from swabbing were culture negative. We observed infection control practices and the environment at the care home for deficiencies. Issues were identified relating to the correct use of personal protective equipment, hand hygiene, clinical waste and laundry. Infection control practices were improved and training given. Infection control practices and the environment at a care home should be examined as part of the investigation of a *S. pyogenes* cluster. Screening for carriage of *S. pyogenes* should be done before antibiotic chemoprophylaxis is issued to care home residents and staff.

Introduction

Invasive infections due to *Streptococcus pyogenes* have been of increasing interest following upsurges in disease incidence in many countries [1-3]. The elderly have had the highest rates of infection [2,4,5] and those in care homes have been identified as being at risk [6-12]. A study in the United States found the incidence of invasive *S. pyogenes* infections among residents of long-term care facilities for the elderly to be almost six times higher than among elderly persons living in the community [10]. Furthermore cases in long-term care facilities were 1.5 times more likely to die compared to community cases affecting the elderly [10]. This population is more vulnerable due to older age and higher prevalence of underlying conditions such as congestive cardiac failure, and also at higher risk due to the potential for transmission of *S. pyogenes* within the care home setting [5,8,10,11].

There has been particular concern about clusters or outbreaks due to *S. pyogenes* occurring in care homes

for the elderly as optimal management in this vulnerable group has not been well defined and has had several aspects [7-12], described below. There is a need for clear guidance, as there has been a lack of uniformity in control measures to be taken for residents and staff to prevent ongoing transmission and further cases of invasive disease occurring in such settings [4,7-9,11,12]. *S. pyogenes* may be transmitted by direct person-to-person contact [4,5] and by fomites in the environment [4,12]. Control measures used in various combinations have attempted to disrupt these modes of transmission in care homes. The management of clusters or outbreaks in care homes has included isolate typing [4,5,7-9,11], establishing the location of cases within a setting [9,13], maintaining vigilance for further cases [4,5], providing information for residents and staff about symptoms [4], identifying residents and staff who have symptoms compatible with *S. pyogenes* infection [4,11], screening residents and staff for carriage of *S. pyogenes* [4,5,9,11,14], review of infection control practices [4,5,9,11,13] and issuing targeted or mass antibiotic chemoprophylaxis to residents and staff without delay or after screening when one or more cases occur [4,8,9,11-13]. Management questions to be answered include the decision whether an investigation should commence after a single case occurs [11], the role of screening [11] and indications for antibiotic chemoprophylaxis [11].

We describe the management of a cluster of *S. pyogenes* in a care home.

Cluster description

Two residents developed *S. pyogenes* bacteraemia at an interval of 55 days apart in April and June 2010. Case 1 had a fall at the care home and developed swelling of the right thigh and calf. Hospital admission was arranged. There was right calf cellulitis, bilateral crackles on chest examination and bilateral consolidation on the chest X-ray. The patient's temperature was 38.2°C. Culture of a blood sample taken on admission yielded *S. pyogenes*. The patient died in hospital eight days later and cause of death was streptococcal

pneumonia. Case 2 was admitted to hospital after one day of deteriorating consciousness. There were bilateral coarse crepitations on chest examination. Right-sided patchy consolidation was seen on the chest X-ray and pneumonia diagnosed. The patient's temperature was 39.7^o Celsius. Culture of a blood sample taken on admission was positive for *S. pyogenes*. The patient died in hospital 12 days later and the cause of death was sepsis.

Epidemiological investigation

After the first case was notified in May 2010 by laboratory report to the local Health Protection Unit, care home staff were informed about the symptoms of *S. pyogenes* infection and asked to remain vigilant for 30 days for further possible cases [4]. On the day the second case was notified, we formed a cluster control team to decide on investigations and control measures. The team members were from the Health Protection Agency, the local National Health Service Hospital Trust and the local Primary Care Trust. Management at the home were unaware of additional earlier cases. Our Health Protection Unit routinely receives statutory notifications of invasive cases of *S. pyogenes* infection. We are satisfied there is no evidence to suggest additional cases occurred prior to the presentation of the two cases.

The *S. pyogenes* isolates from the two cases were forwarded individually as they occurred to the United Kingdom (UK) Streptococcus and Diphtheria Reference Unit, Colindale, London for characterisation. The isolates obtained from blood cultures of both cases were *emm* type st22.6 and indistinguishable by *emm* typing [15-18].

The care home had 27 single bedrooms on three floors. We sought information from the management on environmental links between the two cases including location of their bedrooms and equipment shared by both. The two cases had had no direct contact as the first case had been admitted to hospital 13 days before the second case arrived at the care home. They had resided on the same side of a corridor in different bedrooms which were separated by an unused room and had not shared equipment of other items.

Active case finding

We informed residents, relatives of residents, staff and general practitioners of residents and staff at the care home by letter about the two cases and gave written information about signs and symptoms which might indicate *S. pyogenes* infection [19]. Recipients were advised to contact their general practitioners if they had any concerns about their health. When the management of the care home was asked about symptoms affecting residents and staff which could indicate colonisation or infection with *S. pyogenes* they were aware of one staff member who had a sore throat during the interval between the cases and two residents who had

leg ulcers, one of whom had a leg ulcer prior to both cases.

Nineteen days after the second case was notified, we took a total of 61 specimens from throat and chronic skin lesions of residents, staff and visiting staff who had had close contact with residents (defined by us as face to face contact for longer than 15 minutes at any one time). They included throat swabs from 18 of 19 residents, swabs from leg ulcers of two residents and a swab from a blister of a third resident. It was not possible to obtain a throat swab specimen from one resident who was not cooperative. For staff and visiting staff, throat swabs were taken from 39 of 39 and an eczematous area from one staff member was swabbed.

Specimens were cultured to isolate *S. pyogenes* by inoculation onto blood agar and colistin nalidixic acid agar plates. Plates were incubated at 35-37^o C in a CO₂ incubator for 48 hours and examined for beta haemolytic colonies. Beta haemolytic colonies were Gram stained and colonies of Gram positive cocci in chains were examined using a streptococcal latex agglutination kit (Prolex TM Latex Agglutination). Lancefield group A streptococci (*S. pyogenes*) were not detected in any of the 61 specimens taken.

The staff was asked at the time of swabbing about recent sore throat or skin problems. Five members of staff gave a history of sore throat occurring during the period since the first case presented, two of the five in the interval between the cases and three of the five after case 2. We considered whether antibiotic chemoprophylaxis should be given to residents and staff to eradicate *S. pyogenes* from carriers who posed a risk of infection to others and from those who had newly acquired the invasive strain and who may themselves have been at risk [4,5]. It was decided not to issue antibiotic chemoprophylaxis before the availability of the swabbing results. No further cases of *S. pyogenes* infection occurred after the cluster control team was formed.

Infection control practices

We observed [20-22] infection control practices in the care home environment, i.e. the setting in which infection control practices were undertaken, during an on-site visit. This included obtaining information about the use of personal protective equipment (PPE), staff hand hygiene, management of clinical waste, arrangements for disposal of faeces and urine and management of laundry. Observations were recorded using a local audit tool which was a questionnaire (unpublished).

PPE was not conveniently placed and dirty laundry was handled without wearing PPE. Hand washing technique among staff was poor and wrist and finger jewellery worn. Liquid soap and paper towel dispensers were soiled. Clinical waste was carried through the home for disposal. No foot operated pedal bins were available at the point of care in bedrooms and there was no

central point for the collection of clinical waste on each floor. Commode pots and urinals were decontaminated by hand. Clean and dirty laundry was not separated on trolleys and in storage areas.

Following the identification of these deficiencies, the care home management made the following improvements: PPE was made available in bathrooms and toilets and staff were trained in the correct use of PPE using the Health Protection Agency DVD on infection control [23] and e-learning [24]. Staff received training in handwashing technique and new soap dispensers were installed. Foot-operated clinical waste bins were installed in all bedrooms and a central point for the collection of clinical waste was established on each floor. A room designated solely for the decontamination of commode pots and urinals was identified and upgraded sluice facilities planned. New bags for clean linen and new bins for dirty linen were introduced. Infection control was made part of the induction programme for new staff, an infection control programme was introduced, a champion for infection control in the care home was named, posters on hand hygiene were displayed and auditing of infection control practice was introduced.

Discussion and conclusions

The two cases presented at an interval of 55 days between them. No other cases of *S. pyogenes* infection have been reported at the care home (up to November 2011). It has been suggested that a heightened level of vigilance should be maintained for 30 days after a case occurs in a care home [4]. Invasive *S. pyogenes* cases in long-term care facilities have presented months apart. In 18 clusters investigated in long-term care facilities [10], 14 clusters consisted of two cases each and the other four clusters of three cases each. Similar to the interval in this outbreak, the median interval between the first and second case in these 18 clusters was 2.5 months (range 0.2–9.2 months). The factors that determine the interval between cases, hence the optimal period of enhanced vigilance, are still unclear.

Our cluster demonstrated the importance of typing isolates as has been noted during the investigation of other clusters [7,9,12,14,16]. Isolates from the two cases were indistinguishable, suggesting transmission had occurred within the home. Both isolates were identified as *S. pyogenes emm* type st22.6, a very uncommon type. In the UK during the period April to June 2010, less than 0.5% of all invasive *S. pyogenes* isolates belonged to *emm* 22. Seventy-two (1.65%) of all 4,353 isolates from a pan-European surveillance study during 2003–04 [16] and two of 262 (0.76%) Norwegian isolates in 2006–07 [17] were *emm* 22. *Emm* gene sequence typing identifies the M protein type which is an important *S. pyogenes* virulence factor [15]. *S. pyogenes* types vary over time and are very much dependent upon the geographic location [1–3,6] and income of a country [18]. Therefore, monitoring type distributions is essential to identify any changes in patterns

of disease and to identify and investigate clusters and features of virulence [2,16].

With regard to transmission of *S. pyogenes*, case-to-case transmission by direct contact was excluded for our two cases because they were not present in the care home at the same time. It is interesting that the only environmental link we were able to identify between the two cases was that they had resided on the same corridor in different bedrooms which were separated by an unused room. This invites speculation that the close proximity of these bedrooms may have been significant in regard to transmission by fomites [12] although we have no indication that this occurred. Having to speculate about the causes of outbreaks of *S. pyogenes* is well described in the literature and occurs often [8,9,11–13].

Staff at the care home had been unaware of the diagnoses of both hospitalised cases until contacted by the Health Protection Unit for each case, which is a situation other public health officials have reported [8]. Routine arrangements should be in place to protect care home residents when a cluster occurs although responsibility for protection will vary nationally. Distributing information about *S. pyogenes* infection to residents, staff and their general practitioners was essential in our investigation. The informal feedback received was that relatives and staff found the content of our information reassuring. This reaffirms the importance of communication [4,8].

When enquiring about recent symptoms compatible with infection due to *S. pyogenes*, asking staff members individually while their specimens were being obtained produced more information than asking the management. This approach should be taken when investigating future clusters.

Infections due to *S. pyogenes* are most often spread by aerosols produced in the nose and throat of infected people [7]. Screening of residents and staff for *S. pyogenes* carriage was conducted during the cluster investigation as others have done [7,11,13]. Practical problems encountered included the limited availability of infection control nurses in the community to take specimens and difficulty in taking throat swab specimens from residents with dementia. As no *S. pyogenes* were detected among residents and staff, there is no evidence of carriage within the care home was implicated in transmission to the two cases. As swabbing took place about three months after the first case presented, it is possible to speculate that transient carriers were missed from among the five members of staff who gave a history of sore throat occurring during the period since the first case presented.

If two or more cases of invasive *S. pyogenes* occur in a care home, targeted or mass antibiotic chemoprophylaxis for residents and staff should be considered [4,8,9,11–13]. Antibiotic chemoprophylaxis targeted

only at known carriers has been described [8,11,13]. Mass antibiotic chemoprophylaxis for all residents and staff before the results of screening for carriage of *S. pyogenes* are known has been done in other clusters [9,11,12]. The indications for targeted or mass chemoprophylaxis are not well defined [4,5,11] and we hope our experience will contribute to the debate. After a risk versus benefit assessment we did not proceed immediately to antibiotic chemoprophylaxis but decided to await the results of swabbing. There were five reasons for our decision. We were concerned about the unnecessary use of and possible side effects of antibiotics. There was no information about carriage within the care home. Chemoprophylaxis may not eliminate carriage of group A streptococci (in one study the eradication failure rate was 25% [25]). Comprehensive and prompt swabbing and reporting of results was achievable in this population. Staff were being vigilant about symptoms of *S. pyogenes* infection among residents in order to identify possible further cases without delay.

The negative results obtained from swabbing validated the decision not to proceed immediately to chemoprophylaxis. Our experience indicates that screening for carriage of *S. pyogenes* should be done before antibiotic chemoprophylaxis is issued to care home residents and staff.

We observed deficiencies in the infection control practices [20-24] that were in place in the care home. These were communicated to the management and subsequently addressed. Knowledge and understanding varied among staff. We agree with Schwartz et al. that the limited knowledge of infection control practices among staff [7] has made prevention of the spread of infection in care home settings more difficult. The cluster was an opportunity for the home to review and improve infection control practice and the environment generally. *S. pyogenes* cluster or outbreak investigations need to include a detailed consideration of environmental aspects [5,9,11,13]. Benefits from doing this include optimising measures to decrease the transmission of *S. pyogenes* by fomites [4]. Certain practices were improved with immediate effect including availability and use of PPE, standards of hand hygiene, management of clinical waste disposal, the existing practice of decontamination of commode pots and urinals by hand, and handling and storage of clean and soiled laundry. Infection control practices at the home were revised simultaneously with relevant staff training [23,24] and this approach should be used in future outbreaks.

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