An outbreak of invasive group A streptococcal infection among elderly patients receiving care from a district nursing team, October 2013 – May 2014

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Abstract

Between October 2013 and April 2014 five elderly patients living within a 2 square mile radius, were admitted to local hospitals with severe group A streptococcal cellulitis and septicaemia. Molecular typing confirmed four patients for whom typing results were available to have the same *emm* gene sequence type, *emm* st89. An outbreak investigation was launched and identified that each patient had received care interventions from a district nursing team at their home or local health clinic in the 7 days prior to onset of symptoms.

Keywords

Infection control, *Streptococcus pyogenes*, invasive streptococcal infections, healthcare-associated infections, nursing, outbreak, surveillance

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Introduction

Group A Streptococcus (GAS; *Streptococcus pyogenes*) is a spherical, gram-positive bacterium which can colonise the throat, skin and anogenital tract (Public Health England, 2014). Invasive group A streptococcal infection (iGAS) is a notifiable disease in England and Wales; physicians and laboratories are legally required to report cases to local Health Protection Teams (HPT) to facilitate the follow-up of contacts as per current guidelines (Department of Health, 2010; Guy et al., 2014). The definition of an invasive infection is one in which GAS infects a normally sterile site (Steer et al., 2012a). Most GAS infections are mild, causing sore throat or skin infections such as cellulitis or impetigo but can also cause severe infections including bacteraemia, necrotising fasciitis and streptococcal toxic shock syndrome (STSS) (Health Protection Agency, 2004; Luca-Harari et al., 2009; Steer et al., 2012b). The case fatality rate of invasive disease is high at 20% and has a short incubation period of 1–3 days and is communicable for 10–21 days if untreated (Steer et al., 2012b).

Between 5% and 12% of severe GAS infections are found to be healthcare associated (Steer et al., 2012b). The

majority of the literature on healthcare-associated outbreaks of iGAS concern hospital or care home settings (Steer et al., 2012b) whereas the literature on the transmission of GAS infection to patients living in the community is limited. This study describes the challenges in identifying the source of infection within the community setting and preventing onward transmission to vulnerable risk groups that are treated by healthcare staff. The paper highlights the need for effective infection prevention and control training as well as detailed guidance on the management of community outbreaks involving community healthcare professionals.

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Detection of incident

On 7 March 2013 a London HPT were notified by a local microbiologist of an 83-year-old admitted with severe cellulitis and bacteraemia due to iGAS, complicated by development of STSS. An initial risk assessment was completed and the public health management for an individual case of iGAS infection was followed. On 25 March a second case of STSS due to iGAS in a 96-year-old was notified by the same laboratory. Both patients lived in the same locality and due to the short time period between the notifications of the patients an outbreak investigation commenced.

Outbreak investigation

Retrospective review

A 6-month look-back of the HPT's case management database found two previous cases of iGAS infection notified in October and November 2013. During the course of the investigation, a fifth case of iGAS infection was notified to the HPT, the patient also received care from the district nursing team and therefore showed evidence of ongoing transmission within the community. All cases resided at different locations within a few miles of each other and were admitted to the same local hospital. All of the patients were elderly and their clinical presentations to the local hospital were identical with complaints of fever and severe cellulitis.

Microbiological investigations

Isolates from four of the cases were sent to the PHE Respiratory and Vaccine Preventable Bacteria Reference Unit for further typing to assess the relatedness of strains. Typing was not possible for the initial case that was notified in October 2013 as the isolate was not retained by the local laboratory. Of the remaining four *S. pyogenes* isolates available for testing, all were found to have the same *emm* gene sequence type *emm* st89.0. While *emm* st89 is a common type (Luca-Harari et al., 2009), given the low incidence of invasive disease in the UK coupled with the geo-temporal clustering of cases, data strongly suggested a common source.

Incident management

The successful management of every case of GAS is important, not only to prevent spread and possible serious infection but also to investigate if transmission is occurring from an ongoing and preventable source (Steer et al., 2012b). Following the identification of four confirmed cases of iGAS an Incident Control Team was convened. The aim of the investigation was to identify and eliminate the potential source of exposure, identify any further linked cases and recommend appropriate control measures to prevent ongoing transmission.

Other possible mechanisms for transmission were discussed such as previous healthcare interventions and the possibility of household and social contacts being the source of infection (Health Protection Agency, 2004). In accordance with current UK guidance, all household contacts of the patients were assessed and informed of their exposure. Household contacts are not routinely given antibiotic chemoprophylaxis given the low risk of invasive disease among close contacts and for the lack of evidence for the reduction in risk (Smith et al., 2005). No history of localised GAS infection was reported by household contacts and GPs were notified to observe household contacts for a period of 30 days for signs of GAS infection (Health Protection Agency, 2004).

Epidemiological investigation

The HPT conducted a detailed assessment for each of the reported cases and three of the cases were interviewed to obtain details of their clinical presentation, inpatient stay and underlying health conditions. An initial risk assessment identified that all the patients, including the deceased, received care (wound dressing) from the same district nursing team. Other possible common sources were investigated such as previous healthcare interventions and household or social contacts. No common household or social contacts were identified. In the days prior to onset all of the cases received healthcare interventions from a variety of healthcare staff such as tissue viability nurses, GPs, care home staff and private carers. However, the only epidemiological link common between all four cases was that they all shared the same district nursing team. In the absence of any other apparent common exposure, the investigation focused on the nursing team as the most likely source of infection.

After notification of the fourth iGAS case, the Incident Control Team agreed to screen and assess all 10 nurses within the team. All nurses were assessed for skin lesions and screened for GAS infection by the Infection Control Team. Throat swabs were sent to the Public Health England Laboratory based at the Royal London Hospital to test for GAS infection. All nurses within the team were given chemoprophylaxis to eradicate carriage of GAS in the aims to reduce the risk of invasive disease in their high-risk patients (Health Protection Agency, 2004).

Of the 10 nurses in the team, five had been in contact with the cases 7 days before their onset of illness. The nurses were interviewed and asked whether they had symptoms of local GAS infection (sore throat, fever and rash) prior to, or following contact with the cases. Initial assessment indicated that all 10 nurses had no symptoms of local GAS infection; however, on further assessment four nurses informed they had symptoms of sore throat and fever. The nurses identified as having symptoms of local GAS infection were excluded from work until completing 24 hours'

worth of antibiotic treatment (Health Protection Agency, 2004; Steer et al., 2012b).

Control measures

Given the common epidemiological link to the district nursing team, the Incident Control Team agreed to provide mass chemoprophylaxis for the nurses prior to obtaining screening results. This was to lessen the risk of further transmission considering the severity of disease in the vulnerable patient risk group that have contact with the district nursing team. Targeted prophylaxis on the basis of screening results was discounted given the additional exposure to a potential source of infection and the possibility of failure to detect carriage through sampling failure and/or carriage in non-swabbed sites (Health Protection Agency, 2004).

Enhanced surveillance

A 30-day surveillance period was implemented to monitor potential onward transmission from cases between 2 April and 2 May 2014. Enhanced surveillance was put in place for district nurses who had been in contact with the cases; however, surveillance of all district nursing patient contacts was not implemented due to the high number of contacts and limited timescales for preventative measures. The HPT also heightened awareness for any additional notifications of iGAS between the surveillance period and the Incident Control Team agreed to increase surveillance methods and control measures if further cases linked to the district nursing team were identified after 2 May.

Results from outbreak investigation

Asymptomatic pharyngeal carriage of GAS is common, with prevalence in the range of 5–30% of the general population (Health Protection Agency, 2004) but surprisingly all throat swab samples taken from the district nursing team were culture negative for GAS or other haemolytic streptococci. All nurses had been screened and treated with chemoprophylaxis before the fifth case was notified ensuring that transmission within the community would be reduced if not eliminated.

Due to the lack of microbiological evidence linking the district nursing team as the source of infection, a review of district nursing contact with the cases was undertaken with the aim of finding a common source. The period of contact examined was the 2 weeks prior to onset to allow for misclassification of exact dates of onset. Information detailing patient contact was extracted from client diaries and work lists which showed dates and outcomes of all nursing contact with cases. The results of the review identified that the patient who died of iGAS septicaemia had been in contact with four members of the district nursing team 7 days prior to their onset of symptoms. The review also identified one

nursing staff member had contact with four out of the five patients and could potentially have played a role in onward transmission; however, it was not possible to definitively establish the initial source of infection. This nursing staff member did not report having any symptoms of local GAS infection and re-screening post completion of antibiotic treatment was not possible during the investigation.

Discussion

This paper describes an outbreak of iGAS infection affecting five elderly patients, resulting in one death due to iGAS septicaemia. All cases were seen by their local district nursing team with one nurse epidemiologically linked to all cases. Screening of skin lesions and throats failed to find microbiological evidence to confirm the district nursing team as the source of infection. Prompt initiation of control measures, namely antibiotic prophylaxis, for all nurses in the team appears to have been effective. The identification of a fifth case linked to the nursing team within days of instigating this control measure further supported this approach.

Screening has a clear role to play in the investigation of GAS outbreaks, potentially facilitating a targeted approach to both decolonisation and follow-up screens to ensure clearance. While targeted prophylaxis reduces unnecessary antibiotic consumption, where mass prophylaxis is an option given a limited number of potential sources, such as in this outbreak, it needs to be given careful consideration. If a targeted approach had been undertaken, it would have delayed the implementation of control measures by several days while awaiting results. Given the nature of the duties performed by these nurses and the vulnerability of their patients, this would have potentially led to further cases of iGAS. Furthermore, GAS can colonise many body sites with hospital outbreaks linked to anal and vaginal carriage (Steer et al., 2012b), sites which are not routinely swabbed.

While the review of patient and nurse contacts identified a potential contribution towards onward transmission with one particular nurse, this should be interpreted with caution due to the challenges in identifying all members of the district nursing team that may have had contact with the cases; this included both clinical and non-clinical staff as well as other healthcare staff such as students and assistants. It is possible that the patients may have been in contact with another unknown common source however this is unlikely. It has also been documented that GAS infection can be transmitted by contaminated fomites (Health Protection Agency, 2004). Although the definitive source of infection in this case was not determined we hypothesise onwards transmission in this outbreak was most likely due to carriage by a member of the nursing team who attended infected patients, possibly due to insufficient infection control procedures. The outbreak highlights the need for training and education on Infection Prevention and Control for community healthcare professionals.

Risk of transmission in the community is low compared to institutionalised settings (Health Protection Agency, 2004) and within the UK, there is limited literature on iGAS outbreaks in connection to district nursing teams; this may be due to the long intervals between cases hindering the detection of an outbreak. Detection can also be delayed where cases are not co-located such as in a care home or hospital setting.

UK guidance on the management of close community contacts of iGAS (Health Protection Agency, 2004) has limited recommendations for the use of chemoprophylaxis treatment for clusters in the wider community, leaving the management of this type of outbreak to Outbreak/Incident Control Teams. While existing hospital and acute care guidelines provide a useful guide for healthcare outbreaks (Steer et al., 2012b), we recommend that additional guidance is added to the community guidelines to facilitate a more effective response, as early recognition and prompt initiation of specific and supportive therapy for patients with iGAS infection can be life-saving (Guy et al., 2014). In addition standard infection control procedures should be addressed in local guidance and supported by regular training in order to reduce the spread of iGAS infection in community and hospital settings. Healthcare staff should be aware of the potential consequences of caring for susceptible populations while harbouring infections including skin lesions, wounds and sore throats although asymptomatic throat carriage of GAS also poses considerable risk.

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Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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