Journal of Hospital Infection 87 (2014) 141–144

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

Outbreak of invasive group A streptococcus infection: contaminated patient curtains and cross-infection on an ear, nose and throat ward

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ARTICLE INFO

Article history:
Received 28 February 2014
Accepted 17 April 2014
Available online 10 May 2014

Keywords:
Group A streptococcus
Healthcare-acquired infection
Infection control
Outbreak

SUMMARY

Background: Outbreaks of group A streptococcus (GAS) infections may occur in healthcare settings and have been documented in surgical, obstetrics and gynaecology, and burns units. The environment may serve as a reservoir and facilitate transmission via contaminated equipment.

Aim: To describe the investigation and control of an outbreak of healthcare-associated GAS infection on an ear, nose and throat (ENT) ward in a tertiary referral centre.

Methods: Two patients with laryngeal cancer developed invasive GAS infection (bacteraemia) with associated tracheostomy wound cellulitis within a 48 h period. The outbreak team undertook an investigation involving a retrospective review of GAS cases, prospective case finding, healthcare worker screening and sampling of patient curtains. Immediate control measures included source isolation, a thorough rolling clean with a chlorine-based disinfectant and hydrogen peroxide decontamination of patient equipment.

Findings: Prospective patient screening identified one additional patient with carriage of GAS from a tracheostomy wound swab. Staff screening identified one healthcare worker who acquired GAS during the outbreak and who subsequently developed pharyngitis. Environmental sampling demonstrated that 10 out of 34 patient curtains on the ward were contaminated with GAS and all isolates were typed as emm-1.

Conclusion: This is the first outbreak report to demonstrate patient curtains as potential source for GAS cross-transmission, with implications in relation to hand hygiene and frequency of laundering. Based on this report we recommend that during an outbreak of GAS infection all patient curtains should be changed as part of the enhanced decontamination procedures.

Introduction

Group A streptococcus (GAS) is the main aetiological agent of bacterial pharyngitis as well as more invasive infections including septicaemia and necrotizing fasciitis. Outbreaks of GAS infections may occur in healthcare settings and have been widely documented in surgical, obstetrics and gynaecology, and burns units.[1–4] Transmission is through respiratory droplets

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http://dx.doi.org/10.1016/j.jhin.2014.04.007

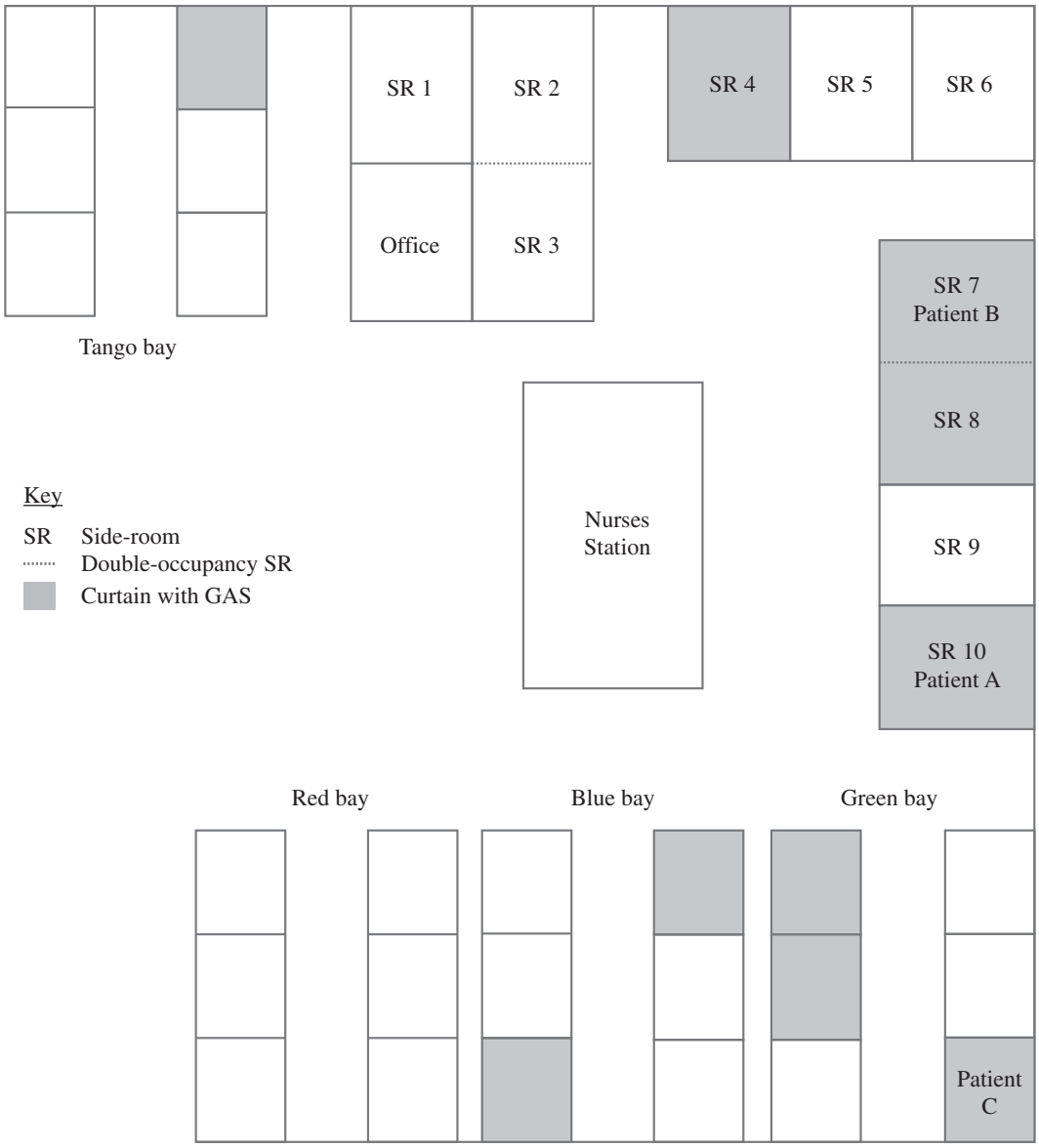

Figure 1. Layout of ear, nose and throat ward showing locations of infected patients and curtains contaminated with group A streptococcus (GAS).

and direct contact between patients and healthcare workers (HCWs).[1] Throat colonization is the most frequent source for onward spread but colonization of HCWs with active skin conditions such as dermatitis also occurs.[4,5]

The environment serves as a reservoir and facilitates transmission through contaminated equipment such as showers and bidets, particularly in maternity units.[6–8] There have also been reports of GAS surviving in dust and on fomites which serve as touch points, contributing to further spread via the hands of HCWs.[1,9]

A healthcare-associated GAS infection is acquired in a healthcare setting and typically develops more than 48 h following admission.[1] Based on recent UK guidelines all healthcare-associated GAS infections should be investigated, and, if there are two or more cases related in person and place, an outbreak control team should be set up.[1]

Methods

Description of the outbreak

Two patients with laryngeal cancer on an ear, nose and throat (ENT) ward in a tertiary referral centre developed invasive GAS (iGAS) infection (bacteraemia) with associated tracheostomy wound cellulitis within a 48 h period. Patient A was an 82-year-old man with cognitive impairment who had undergone tracheostomy formation in a day-case theatre 27 days previously and who had remained an inpatient in a side-room receiving oncological treatment. Patient B was a 73-year-old man on the same ward in a different side-room who had undergone urgent tracheostomy formation on the ward 16 days previously and who had remained in hospital awaiting further investigations and treatment planning. The ward was a

34-bedded unit consisting of four bays (each with six beds), two double occupancy and six single occupancy side-rooms (Figure 1). All bays as well as side-rooms had ceiling-to-floor patient curtains to facilitate privacy for individual patient examination. In response to two potentially linked cases, an outbreak team was convened to identify any common exposures or variables.

Investigation and control measures

Immediate control measures involved source isolation of the two iGAS cases and the use of personal protective equipment by HCWs. A surgical mask was advised when aerosol-generating procedures were performed and the importance of hand hygiene highlighted. A thorough rolling clean was implemented with disinfection of the ward environment with a chlorine-based disinfectant; based on preliminary results from environmental sampling, all patient curtains were replaced. All accessory equipment on the ward such as drip stands, trolleys, and blood pressure cuffs were cleaned, placed in an unoccupied sealed room, and decontaminated with dry-mist hydrogen peroxide (Glosair™ system, Advanced Sterilization Products, Wokingham, UK).

The outbreak team collected data on inpatient journeys, reviewed records of tracheostomy care, and performed a retrospective review of GAS cases over the previous 12 months. Patient screening was undertaken by swabbing tracheostomies and clinical wounds from all patients on the ward. HCW screening was performed in conjunction with occupational health using throat swabs and eliciting a history for skin lesions or recent sore throat. A staff information leaflet was produced to educate staff on GAS and the rationale for screening.

Environmental sampling

Based on a previous outbreak of iGAS in the hospital, it was also decided to undertake environmental sampling of all the ward patient curtains.[10] Patient curtains were sampled at the most frequently touched section using a 'sweep-plate' method. Briefly, this involved sweeping a blood agar plate across ~0.25 m^2 of both sides of the curtain surface, using the plastic rim of the plate to dislodge dust and loose fibres on to the surface of the agar without any direct contact between the agar surface and curtain material. Agar plates were incubated at 37 °C for 48 h and isolates confirmed to be GAS by colonial morphology, streptococcal grouping, and biochemical identification.

All GAS isolates obtained were forwarded to the reference laboratory for emm (M protein) and T typing.

Results

An examination of the inpatient journeys for patients A and B revealed that both had required repeated tracheostomy tube replacement with laryngoscopy on the ward. Analysis of the laryngoscope serial numbers showed that different devices had been used and that there had been no common operators for both patients. Patient A had a history of dementia and was frequently found by nursing staff in other patients' rooms, as he was unable to remember the location of his own side-room.

A retrospective review of GAS cases over the previous 12 months identified no new patients associated with the outbreak. Prospective patient screening identified one additional patient (patient C) in green bay with carriage of GAS from a tracheostomy wound swab (Figure 1). He was also isolated in a side-room with eradication therapy administered.

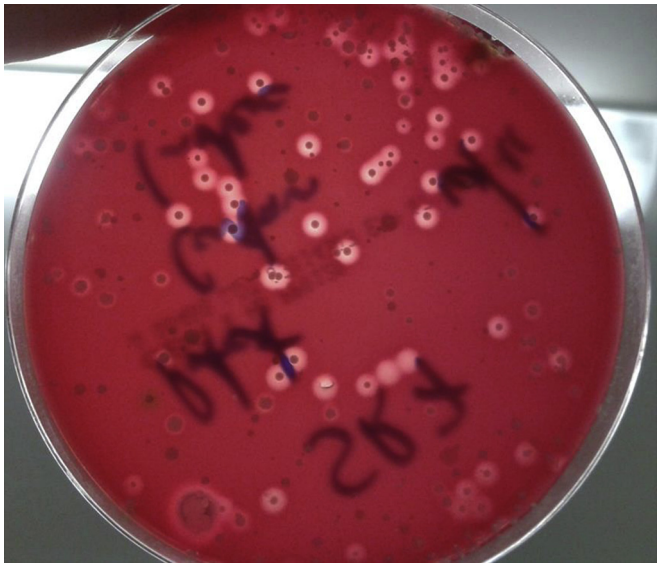

Figure 2. Curtain sweep plate from side-room 10.

Throat swabs were taken from 125 HCWs. This identified one HCW who was symptomatic with pharyngitis and who had been involved in the care of patients A and B. Bacterial throat swab from the HCW yielded a GAS culture. Treatment was prescribed and the HCW advised to remain off work for 48 h. No HCWs were found to have any skin lesions.

Environmental sampling detected GAS in 10 of the 34 ward curtains (Figure 1). The highest colony counts were in patient A's side-room (Figure 2) but GAS was recovered from patient curtains throughout the ward (Table I). GAS isolates from the three patients, the HCW and all the curtains were confirmed to be emm st1.0 (M type 1), T-type 1.

Discussion

Several studies have shown that bacteria including meticillin-resistant *Staphylococcus aureus* can survive on

Table I
Curtains contaminated with group A streptococcus (GAS) on ear, nose and throat ward with colony-forming units (cfu) per plate

Location	GAS cfu/plate
Green bay, bed 3	3
Green bay, bed 5	4
Green bay, bed 6	1
Blue bay, bed 1	1
Blue bay, bed 4	2
Tango bay, bed 4	2
Side-room 4	1
Side-room 7	14
Side-room 8	4
Side-room 10	42

fabrics, but this is the first report to demonstrate curtains as the potential source of cross-transmission of GAS.[11,12] There is some debate regarding the length of time that GAS is able to survive in the environment, but there is emerging evidence that it may have the ability to remain infectious for prolonged periods within a desiccated biofilm.[13]

ENT surgeons regularly manage patients with quinsy, and GAS is one of the leading aetiologies. We therefore hypothesize that patient A was infected due to lapses in hand hygiene when urgent laryngoscopy and tracheostomy tube replacement were required. Subsequent interventions are likely to have contaminated the curtains through direct droplet spread and contact with contaminated hands. This is suggested by the highest colony counts of GAS being detected from the curtain in side-room 10 (Table 1, Figure 2). Subsequent cross-transmission is likely to have occurred to patient B because he also required multiple interventions with his tracheostomy. Due to the underlying cognitive impairment, patient A was often found in other bays/side-rooms and he may have inadvertently contributed to further spread of GAS. HCWs may also have contributed to cross-transmission through lapses in hand hygiene because curtains throughout the ward were contaminated. The onset of symptoms in the HCW was consistent with acquisition of GAS during the outbreak rather than the source, but could have facilitated cross-transmission to other patients.

Based on the results, environmental cleaning and changing of all patient curtains was expedited. Concerted efforts were also made to ensure that patient A remained in his side-room while undergoing treatment with close nursing supervision. No further cases of hospital-acquired GAS were reported with continued surveillance following implementation of control measures and eradication of carriage from the three patients and HCW. We also noted that patients A and B were screen positive from the tracheostomy site despite having had 48 h of penicillin therapy. Hence, isolation precautions were continued until screening samples from the tracheostomy site were negative.

There are several limitations of this outbreak report. Apart from patient curtains, no other environmental sampling was performed and it is possible that there were other potential sources for cross-transmission. HCW screening was performed only by throat swabs and we did not test other sites such as the perineum. The method used to screen the curtains was not precise and therefore dependent on the area of curtain sampled. However, this was a practical method for sampling curtains in a clinical environment. Finally, emm-1 is a GAS type frequently encountered locally, and the isolation of this strain may not necessarily represent an outbreak. However, all the isolates were exactly the same emm and T type, which strongly suggests that they were linked.

This report demonstrates the importance of hand hygiene and that patient curtains may harbour potential pathogens including GAS. The location of handwash basins and alcohol gel and the sequence of hand hygiene and curtain opening/closing are especially important. Hands of HCWs may become contaminated by organisms harboured in the fabric of curtains if they are handled after hand hygiene has been performed. The frequency of curtain change and laundering is also relevant because contamination of the fabric is inevitable and this can contribute to cross-transmission. The use of fabric curtains, particularly on surgical wards, needs to be reviewed because alternative technologies such as disposable curtains and plastic screens are now available.

Based on this report, we recommend that during an outbreak of GAS infection all patient curtains should be changed as part of the enhanced decontamination procedures, and that this recommendation be included in the UK guidelines when updated. We would also recommend that during an outbreak patients should remain isolated until negative screening swabs are obtained, rather than stopping isolation precautions after 48 h.

Acknowledgements

We thank J. Turton, biomedical scientist, for her work in the laboratory.

Conflict of interest statement
None declared.

Funding sources
None.

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