Methicillin-resistant *Staphylococcus aureus* in the community in West Essex

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SUMMARY

The study was undertaken in response to local concerns of a rising number of community-acquired methicillin-resistant *Staphylococcus aureus* (MRSA) infections. All patients resident in the community in Essex at the time of diagnosis with a first isolate of MRSA between 1994 and 2001 identified by the diagnostic microbiology laboratory were included. Although the annual incidence rose throughout the study period the majority of those with MRSA (82%) had had hospital contact within the last 5 years. The subset of patients without hospital contact had a median age of 79·5 years, 63% were female and 32% were residents of care homes. Carriage in this population was detected for up to 41 months post-diagnosis. Neither antibiogram nor clinical presentation distinguished these isolates from local hospital-acquired strains.

INTRODUCTION

The following study was undertaken in response to local concerns that the incidence of community-associated methicillin-resistant *Staphylococcus aureus* (MRSA) was rising, resulting in additional transmission to hospital in-patients. There have been a number of reports from all over the world, including the United Kingdom, of an increase in skin and soft-tissue infections caused by MRSA acquired in the community [1–3]. Deaths have occurred in children [4], and outbreaks amongst adults including athletes, men who have sex with men, and prisoners [5]. Unlike patients with nosocomial MRSA these individuals are usually young, otherwise healthy with little or no contact with health-care facilities.

In the literature at least eight different definitions of community-acquired MRSA have been used [1]. In the following study we defined community-associated MRSA as isolates from patients whose colonization was first identified whilst they were living in the community. The community included residence in their own or a nursing or residential home. Community-acquired MRSA was defined as isolates from those patients with community-associated MRSA who had had no contact with acute or community hospitals as in-patients, outpatients or health-care workers within a defined period.

METHODS

This was a descriptive study. We followed up West Essex residents with community-associated MRSA between July 1994 and December 2001. Samples for culture were sent to the Princess Alexandra Hospital microbiology laboratory which serves all general practices in the Harlow local authority area. The latter

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covers the same geographical area as the Primary Care Trust and also serves selected practices in the neighbouring areas of Uttlesford and Epping Forest.

Isolation of MRSA

MRSA was detected in screening swabs as follows. Swabs were broken off into a universal container with 7·5 % salt broth and incubated at 37 °C for 18–24 h. The broth (10 μl) was subcultured onto oxacillin-resistant screening agar (ORSA; Oxoid, Basingstoke, Hampshire, UK) and these were incubated at 35–37 °C for 18–24 h. Blue colonies from these plates were subcultured to Staph/Strep selective agar (Oxoid) and Staphylase tests (Oxoid) performed. The identity of all presumptive MRSA was confirmed by DNAase production, tube coagulase positivity and resistance to 2 mg/l oxacillin. Antibiotic susceptibility testing was carried out using discs in accordance with British Society of Antimicrobial Chemotherapy guidelines. Antibiograms were examined in hospital-acquired, community-associated and community-acquired strains to detect any unique resistance profiles. Selected isolates were referred for further characterization to the Staphylococcal Reference Laboratory, Laboratory of Health Care Associated Infection, Health Protection Agency, Colindale, London.

Patient follow-up

Patients were referred to the community infection control nurse for follow-up. At the time of referral the nurse contacted the patient's general practitioner and completed a simple questionnaire with patient details and questions on hospital admission, other health-care contact and whether residence was in a nursing or residential home. These forms were collected and entered into a Microsoft Access database.

In addition the hospital patient administration system (PAS) was searched for further evidence of health-care contact, and the laboratory computer system for subsequent relevant samples. For the purposes of the study a 'relevant sample' was defined as one from a site previously colonized or infected with MRSA, or one which would be included in a screening set (i.e. nose, throat or groin).

Outcome of MRSA colonization

Patient survival and length of time colonized with MRSA were calculated using the Kaplan–Meier technique. For the latter calculation patients were considered to be MRSA positive, regardless of intermediate results, until the last sample with MRSA was taken. Those who had at least one further negative sample taken from a relevant site were considered to be MRSA free and to have left the study. Patients whose final sample was still MRSA positive were considered lost to follow-up.

The number of patients who met a stricter definition of three clear sets of screening from carriage sites (nose, groin and any other site identified as positive) was also examined. A search was also made for evidence of subsequent serious sepsis by the isolation of MRSA from normally sterile sites, i.e. blood, joint or deep tissue, bronchoalveolar lavage or cerebrospinal fluid samples.

Incidence calculations

It is not possible to define properly the whole population served by the hospital laboratory, as this varies with time depending on the practice of different general practitioners. However, the location of the hospital meant that it is unlikely that samples from residents of the Harlow local authority would be sent anywhere other than the local hospital laboratory. The incidence of community-acquired MRSA was, therefore, calculated with the local authority population [6] as the denominator and MRSA-positive patients with a general practitioner in Harlow as the numerator. We also calculated incidence using the Primary Care Trust registered population [6] for those years it was available.

RESULTS

Community-associated MRSA

A total of 423 patients (188 males, 231 females and 4 of unknown gender) with community-associated MRSA were followed up. Patients remained MRSA carriers up to 41 months after diagnosis using our definition of a single relevant sample as indicating loss of carriage status. If a stricter definition of three clear screening samples is adopted then only three patients were shown to be MRSA free. The number of patients lost to follow-up or dying was such that it was not possible to calculate a useful mean time of colonization. We therefore examined the proportion of patients remaining MRSA positive at monthly intervals as shown in Figure 1. Two patients developed serious
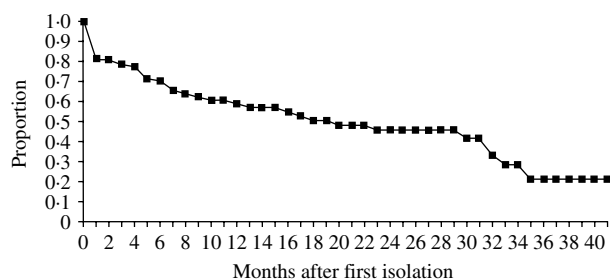
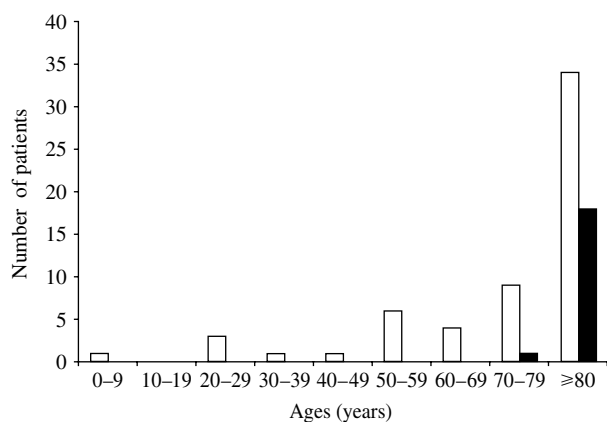**Fig. 1.** Proportion of patients remaining colonized with MRSA.

Fig. 2. Age distribution of community-acquired MRSA cases. □, Total cases; ■, nursing home contact.

Table. *Site of first isolation of MRSA*

Site of isolation	No. of patients total	Nursing home residents	No known nursing home contact
Acute wound (surgery/trauma)	6	1	5
Chronic wound (ulcer/bed sore)	32	12	20
Sputum	2	0	2
Urine	4	3	1
Other (including incomplete clinical details)	16	3	13

sepsis 1 and 30 months after initial MRSA isolation. There were no reports of patients with boils or other deep-skin infections or pneumonia.

Throughout the period the most common antibiotic sensitivity pattern in both hospital- and community-associated strains was erythromycin and ciprofloxacin resistant, fucidin, trimethoprim, gentamicin, rifampicin and mupirocin sensitive. There was a trend towards loss of multiple resistances. In 1997, 40% of community-associated and 32% of hospital strains had this antibiogram. In 2001 the proportions had risen to 78% and 75% respectively. All MRSA isolates were typed in 1997 and 1998, after this time selected isolates from unusual clusters only were examined. All typable isolates throughout the period were identified as epidemic strains EMRSA-15 or EMRSA-16.

Community-acquired MRSA

There was incomplete data on hospital contact for 82 out of 423 patients (19%) in the study. These were patients who may have attended hospitals outside the district, but it was not possible to verify this. Of the remaining 341 patients 274 (80%) had had hospital contact (as an in-patient or at outpatient clinics) within the last 6 months and 281 (82%) within the last 5 years. The longest period of colonization documented was 41 months. We therefore considered those without hospital contact in the last 5 years as having community-acquired MRSA. The characteristics of these 60 patients and their MRSA isolates were examined in more detail.

The majority of patients were elderly with a median age at diagnosis of 79·5 years (Fig. 2). There were more females (38/60, 63%) than males. Nineteen (32%) were in care homes at the time of diagnosis. Only 73% were alive at 3 years after diagnosis, but there were then few further deaths up to 6 years post-diagnosis. The single patient <10 years of age was the child of a health-care worker. The most common site of isolation (32/60, 53%) was chronic wounds such as leg ulcers and bed sores in both nursing home and non-nursing home residents (Table). However, in those <60 years only one person had a primary isolate from a chronic wound. The remaining 11 isolates included six from surgical or trauma wounds and three from ears with otitis externa.

Community-acquired isolates had a similar antibiotic sensitivity pattern to other local strains, where a complete antibiogram was recorded. Overall 67% (37/55) had the usual local pattern described above. The proportion with this pattern varied from 44% in the years 1996 to 1999 up to 74% in 2001. No antibiogram was particularly associated with the community-acquired isolates or any subgroup of them. Between one and six isolates were resistant to one or more of trimethoprim, fucidin, gentamicin, tetracycline or mupirocin or sensitive to ciprofloxacin or erythromycin.
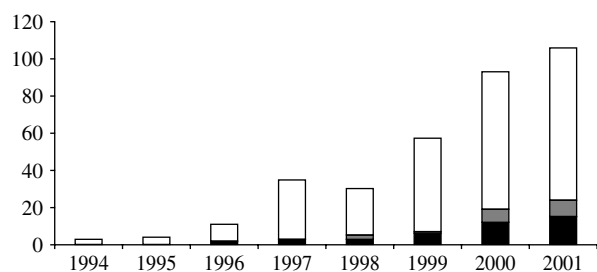
Fig. 3. New cases of community-associated MRSA. □, Hospital contact; ▨, nursing home but no hospital contact; ■, no hospital or nursing home contact.

Fig. 4. Incidence of community-acquired MRSA in Harlow. --▲--, 95 % upper confidence limits; --◆--, 95 % lower confidence limits; --■--, incidence per 100 000 (resident population); --✕--, incidence per 100 000 (registered population) (data for 2000 and 2001 only).

The incidence of new cases of community-associated MRSA rose each year throughout the study period (Fig. 3) and the proportion that was community acquired varied from 16 % to 23 % without any clear trend. The incidence of new cases of community-associated and community-acquired cases (calculated using the local authority population) is shown in Figure 4.

DISCUSSION

We attempted to identify patients with truly community-acquired MRSA, i.e. those who had had no recent contact with hospital services as either in-patients or outpatients. Other authors [7–9] have used an arbitrary time of 6 months to define those without recent hospital contact. However, we found that patients could remain colonized with MRSA for up to 41 months. This is a conservative estimate, as we considered a single relevant negative sample as evidence of loss of MRSA carriage whereas usually at least three separate screens of all appropriate carriage sites is required [10]. Others have also described long-term carriage [11]. Only three patients in the study met the stricter criterion of three clear sets of screening samples. Local policies discourage screening in the community in the absence of clinical signs of sepsis, which would again underestimate the number of patients with long-term colonization. The data suggest that prolonged carriage of MRSA in the community is more common than is generally appreciated.

Data are sparse on the long-term effects of MRSA colonization. O'Sullivan & Keane [12] found that 7·4 % of colonized nursing home residents developed MRSA infection, including conjunctivitis, wound and ulcer infections and in one case bacteriuria, but none which met our criteria for serious sepsis. The numbers of isolates from wound, urine and sputum samples in
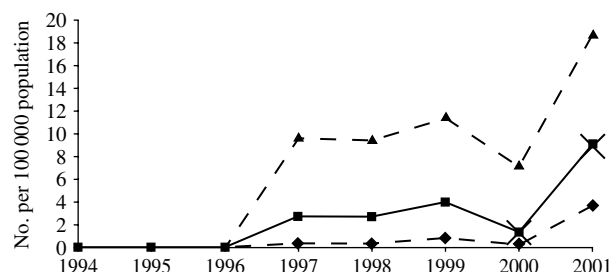
our study also suggest MRSA was associated with continuing minor infection problems. Only two patients were identified with evidence of subsequent serious sepsis with MRSA. However, it is difficult to know whether this reflects low rates of infection or failure to investigate in the community.

Several studies have examined the prevalence of community-associated MRSA [13, 14] but few have distinguished patients who may have been colonized in hospital or calculated incidence. In this study although the annual incidence of community-associated MRSA rose throughout the period, the proportion of patients with truly community-acquired MRSA remained <25 % of the total, and the incidence remained very low. It is notable that the rise in incidence of community-acquired cases paralleled the rising numbers of community-associated cases overall. The majority of those colonized were elderly, many were female and nearly a third were residents of care homes. In the past a major risk factor for MRSA in care home residents was previous hospital admission [15, 16], but this may now be changing with reports of increasing transmission in homes [17, 18]. The most common source of the primary isolate was chronic wounds (ulcers and bed sores), which are recognized as a major risk factor for MRSA [15, 16]. However, there were only 19 patients in care homes with community-acquired MRSA identified in over 6 years. It was not possible to establish a denominator for these cases but there are over 50 homes in the area served by the laboratory suggesting that transmission in care homes up to 2001 was not a major problem.

Twelve people with community-acquired MRSA were <50 years old, one of whom was a known contact of a health-care worker. The sources of the primary isolates were mainly acute wounds or from otitis externa. Otherwise there was little to distinguish

these isolates from other community-associated strains. They did not have a unique antibiotic profile nor was there evidence of serious sepsis (carbuncles, deep abscesses) as has been described with community-acquired strains from elsewhere [3, 19]. Unfortunately, we did not investigate what are now known to be risk factors for community-acquired strains such as contact sports or intravenous drug abuse in our questionnaire as the majority of patients were very elderly. This needs to be the subject of further study in the group of younger patients.

Although the data show that there is some transmission of MRSA in the community they suggest that during the study period the strains involved were similar to those from the local hospital. There is nothing to suggest that the virulent community-acquired strains seen elsewhere were a problem in West Essex up to 2001.

DECLARATION OF INTEREST

None.

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