

# REPORT

## ON METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* BACTERAEMIA IN SCOTLAND,

### APRIL 2002 TO MARCH 2003

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#### Key points

- This report of methicillin-resistant *Staphylococcus aureus* (MRSA) in acute trusts in Scotland provides data on the rates of MRSA bacteraemias (blood infections) for 14 acute NHS trusts, one health care trust and three island boards in Scotland in the twelve-month period April 2002 to March 2003.
- Between April 2002 and March 2003, recorded MRSA bacteraemia rates ranged from 0.0 per 1000 bed days to 0.33 per 1000 bed days with an average for Scotland of 0.17/1000 bed days. These results are very similar to those recently published for England in the same period.
- Statistical analyses of the data suggest that rates of MRSA bacteraemia in Scotland and in individual trusts have remained at approximately the same level (i.e. there has been no statistically significant change in the rates) between January 2001 and March 2003.
- Comparisons between trusts of the bacteraemia rates should be made with great caution for several reasons, including the following:
  - Patients may not have acquired the MRSA in the trust where the MRSA bacteraemia was diagnosed. Laboratory reports of MRSA bacteraemia include reports on patients who became colonized or infected in a different hospital from the one that diagnosed and reported the bacteraemia, as well as reports on patients who became colonized or infected in the community.
  - The data reflect the overall position in trusts that differ in the numbers of patients at high risk of MRSA carriage and infection. Certain groups of patients e.g. the elderly, renal patients, diabetics, some surgical patients and patients with previous hospital admissions are more prone to MRSA carriage and infection.
- These data provide trusts with the opportunity to examine their own performance in the context of the national data. The data provided in the quarterly reports will be used, in the longer term, to monitor trends in MRSA in acute trusts in Scotland and as one of several indicators of the efficacy of infection control processes.

#### 1. Background

- 1.1 This report of MRSA bacteraemias (blood infections) in acute hospital trusts in Scotland is required by Health Department Letter (2001)57 'A Framework for National Surveillance of Hospital Acquired Infection in Scotland'<sup>1</sup>.
- 1.2 Previous reports can be accessed on the web at [http://www.show.scot.nhs.uk/scieh/#infectious/hai/MRSA\\_Scot.htm](http://www.show.scot.nhs.uk/scieh/#infectious/hai/MRSA_Scot.htm)
- 1.3 MRSA carriage and infection have been regarded as markers of potential or real hospital acquired infection. However, community acquired carriage is increasingly reported<sup>2,3</sup>.
- 1.4 The rates of MRSA bacteraemia diagnosed in trusts in the period April 2002 to March 2003 are reported here. They are based on reports of diagnoses of MRSA bacteraemia to the Scottish Centre for Infection and Environmental Health (SCIEH) by microbiology laboratories in Scotland. Rates of MRSA bacteraemia, a serious infection due to MRSA, are currently the best available indicators of the amount of MRSA in trusts.
- 1.5 For ease of reference, a description of the methods of data collection, analysis and reporting is provided in Section 2.
- 1.6 It is important that the results are read in conjunction with the notes on interpreting the data provided in Section 3.

## 2. Data sources, data analysis and reporting

- 2.1 The figures and table show the rates of MRSA bacteraemia for 14 acute NHS trusts, one health care trust and three island boards in Scotland (hereafter referred to as 'trusts') reported to SCIEH by microbiology laboratories.
- 2.2 The rate presented in the graphs and tables is the number of 'episodes' (cases) of MRSA bacteraemia in the trust divided by the total number of occupied acute 'bed days' for the period. (One patient in one bed for one night is one occupied 'bed day'). The rate given is the number of cases of MRSA bacteraemia diagnosed per 1000 bed days. This provides an index of MRSA bacteraemia in the trust that relates the diagnosed cases to the total number of days during which patients have been in hospital in the twelve-month period.
- 2.3 The data on 'patient bed days' have been obtained from the Information and Statistics Division of the NHS in Scotland. They are based on the 24 hourly midnight counts of occupied beds that are undertaken in every hospital. These counts exclude patients treated as day patients who, by definition, do not occupy a bed at midnight.
- 2.4 Confidence intervals for the rates (shown in Tables 1 and 2) indicate the range within which one can be 95% confident that the true rate will fall.
- 2.5 The data are also presented in the form of a 'control chart'<sup>4</sup>. On the chart the rates for individual trusts are plotted. The chart also includes upper and lower limits (in this case defined by +/- three standard deviations of the Scottish rate). This approach is based on an assumption that rates in trusts will be largely similar, and allows the distinction between 'common cause' or natural variation, when a trust's rate falls within the limits, and 'special cause' variation, where something unusual is occurring in a trust which results in a rate which falls outside these limits. The latter result should lead to a search for the explanation for the unusual situation, unique to that trust, which results in a rate that lies outside the limits. This could be the result of either a true high or low rate of MRSA bacteraemia or due to reporting biases, e.g. incomplete reporting or over-reporting.

Table 1: MRSA bacteraemia rates by acute Trust with 95% confidence interval limits: April 2002 to March 2003

Trust Name	Trust Category	MRSA per 1000 bed days	MRSA per 1000 bed days	
			Lower CL	Upper CL
Argyll & Clyde	General Acute	0.0860	0.0608	0.1180
Ayrshire & Arran	General Acute	0.1125	0.0817	0.1510
Borders	General Acute	0.1434	0.0763	0.2452
Dumfries & Galloway	General Acute	0.1489	0.0851	0.2417
Fife	General Acute	0.2575	0.1969	0.3307
Forth Valley	General Acute	0.1480	0.1025	0.2069
Grampian	Teaching	0.1156	0.0877	0.1494
Highland	General Acute	0.1284	0.0831	0.1895
Lanarkshire	General Acute	0.1535	0.1199	0.1936
Lothian	Teaching	0.3287	0.2836	0.3738
North Glasgow	Teaching	0.2284	0.1950	0.2619
Orkney	Island	0.0000	0.0000	0.1491
Shetland	Island	0.0000	0.0000	0.1381
South Glasgow	Teaching	0.0945	0.0692	0.1261
Tayside	Teaching	0.1895	0.1474	0.2398
Western Isles	Island	0.0166	0.0005	0.0925
West Lothian	General Acute	0.0778	0.0445	0.1263
Yorkhill	Specialist	0.0486	0.0132	0.1244

Table 2: MRSA bacteraemia rates by acute Trust with 95% confidence interval limits: April 2001 to March 2002

Trust Name	Trust Category	MRSA per 1000 bed days	MRSA per 1000 bed days	
			Lower Limit	Upper Limit
Argyll & Clyde	General Acute	0.0762	0.0531	0.1060
Ayrshire & Arran	General Acute	0.1130	0.0824	0.1512
Borders	General Acute	0.1875	0.1092	0.3003
Dumfries & Galloway	General Acute	0.1315	0.0718	0.2206
Fife	General Acute	0.2762	0.2136	0.3514
Forth Valley	General Acute	0.1398	0.0956	0.1973
Grampian	Teaching	0.0982	0.0727	0.1298
Highland	General Acute	0.0749	0.0420	0.1236
Lanarkshire	General Acute	0.1981	0.1580	0.2452
Lothian	Teaching	0.3615	0.3151	0.4080
North Glasgow	Teaching	0.1360	0.1105	0.1656
Orkney	Island	0.0853	0.0102	0.3079
Shetland	Island	0.0000	0.0000	0.2534
South Glasgow	Teaching	0.1016	0.0741	0.1359
Tayside	Teaching	0.2177	0.1729	0.2706
Western Isles	Island	0.0308	0.0037	0.1112
West Lothian	General Acute	0.0468	0.0225	0.0861
Yorkhill	Specialist	0.0121	0.0004	0.0675

### 3 Interpreting the data

Direct comparisons between trusts of the reported MRSA rates should be made with great caution for several reasons:

- 3.1 Trusts' patients differ in their vulnerability to MRSA colonization and infection. A single trust may include different kinds of hospitals, e.g. teaching or general hospitals, different specialties with varying numbers of patients, and therefore differing numbers of vulnerable patients. These differences contribute to differences in the MRSA bacteraemia rates. Trusts with more patients in vulnerable categories, e.g. the elderly, renal patients, some types of surgical patients, may have higher rates. Trusts that receive patients transferred from other hospitals or large numbers of patients with recent hospital admissions, may also have higher rates of MRSA infection.
- 3.2 MRSA bacteraemias in renal dialysis patients are included in the number of cases diagnosed in trusts where such patients are treated. The bed days occupied by them are not included in the 'total occupied bed days' as these patients are treated as day patients. As a result, calculated rates may be artificially high.
- 3.3 A patient may be admitted already colonized with MRSA and then develop an MRSA bacteraemia in hospital. He/she may have become colonized in another hospital or in the community. The numbers of bacteraemias diagnosed therefore may include MRSA acquired elsewhere. For this reason it is not correct to use the numerical data provided to quantitatively estimate differences in the risk of MRSA acquisition in different hospitals.
- 3.4 MRSA bacteraemia data have been obtained from laboratories in acute trusts that may also provide services to a primary care trust. It is not possible to exclude MRSA bacteraemias from these trusts (which are likely to be very small in number).

### 4. Results

- 4.1 Rates of MRSA bacteraemia reported in Scotland in the twelve-month period, April 2002 to March 2003, ranged from 0.0 /1000 patient bed days to 0.33 /1000 patient bed days (Table 1).
- 4.2 In total, 878 episodes of MRSA bacteraemia were reported in Scotland for the twelve-month period, April 2002 to March 2003, giving an overall rate for Scotland of 0.17/1000 bed days (95% CI 0.16/1000 bed days to 0.18/1000 bed days). This suggests that, on average, a patient who stays in hospital for 10 days has approximately a one in 600 chance of getting an MRSA bacteraemia. However, it is important to note that the risk to an individual may be higher or lower, as patients differ in their vulnerability to MRSA infection.
- 4.3 Figure 1 shows that the majority of Scottish Trusts reported MRSA bacteraemia rates during the period April 2002 to March 2003 that fall within the defined limits. Three trusts have rates that are above the upper limit of three standard deviations based on the all-Scotland rate. Three trusts recorded rates of MRSA bacteraemia that are below the lower limit.
- 4.4 Table 2 presents the MRSA bacteraemia rates reported by trusts during the period April 2001 to March 2002, for comparison with the data presented in Table 1. Rates have changed very little between the two twelve-month periods reported in all but one of the acute trusts - North Glasgow.
- 4.5 Figure 2, which shows the trends in MRSA bacteraemia rates in Scotland for the nine three-month periods between January 2001 and March 2003, indicates that the rates have not increased or decreased consistently over the period. Graphical representation of the trends in MRSA bacteraemia in individual trusts over the whole period of surveillance i.e. January 2001 to April 2003, did not show any consistent trend. These observations are supported by statistical analyses of the data for the period.

Figure 1: Episodes of MRSA bacteraemia per 1000 total occupied bed days. April 2002 to March 2003. In Scottish Acute NHS Trusts.

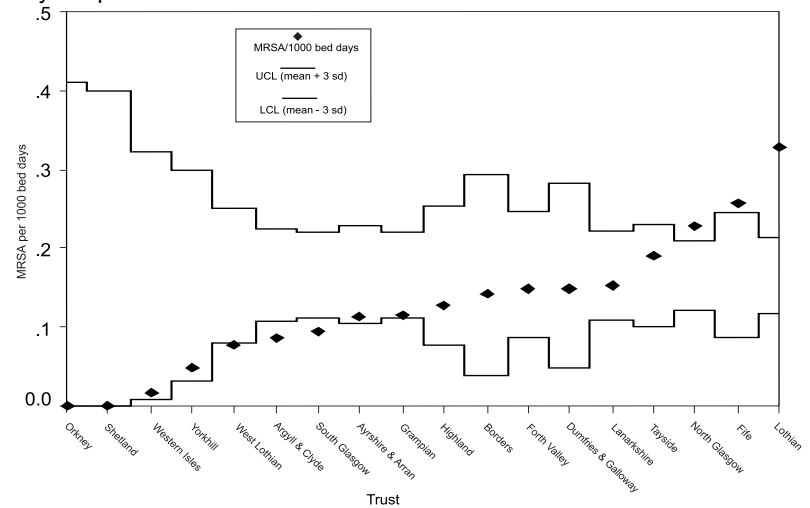
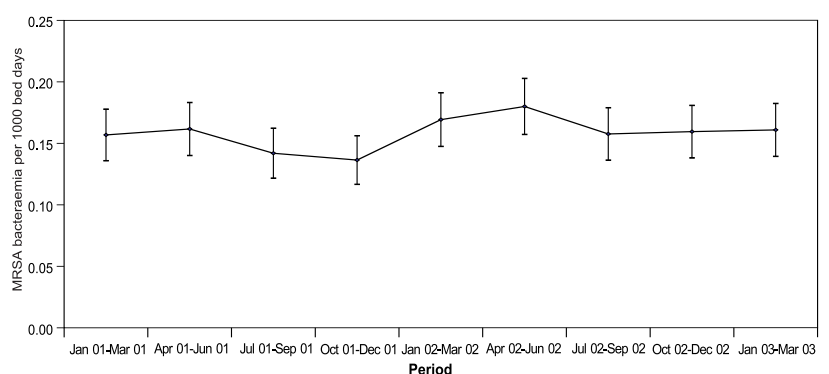


Figure 2: Quarterly MRSA bacteraemia rates per 1000 occupied bed days



- 4.6 Statistical analyses have also been undertaken to examine the contribution to the variation in rate between trusts, of the type of trust (teaching, general, island or specialist paediatric), the three-month period and the geographic location of the trust. These support the observation that rates in teaching and general trusts are similar and are different from those in the island boards and the single specialist paediatric hospital where MRSA bacteraemia rates are lower.

## 5. Comments

- 5.1 Overall, rates of MRSA bacteraemia in Scotland have not changed in the period under surveillance. The MRSA bacteraemia rate between April 2002 and March 2003 of 0.17 per 1000 patient bed days was not significantly different from the rate of 0.15 per 1000 patient bed days recorded in April 2001 to March 2002. The total number of bacteraemias reported in the current reporting period was 878, compared with a total of 818 for the twelve month period April 2001 to March 2002.
- 5.2 The overall rate of MRSA bacteraemia in Scotland ( 0.17 per 1000 bed days; range 0 to 0.33/1000) is identical with that reported for the same period for acute trusts in England viz 0.17 per 1000 bed days. The range reported for general trusts in England is 0.04 to 0.30/1000 and that for specialist trusts is 0.06 to 0.49/1000<sup>5</sup>.
- 5.3 While there was little change in the rates in the majority of hospitals there appears to have been an increase in the rate in April 2002 to March 2003 over that in the period April 2001 to March 2002 for one teaching trust which includes more than one hospital. This trust reported a very low number of MRSA bacteraemias in the second two quarters of 2001 and it is these two reports that are numerically responsible for the increase observed in the two consecutive twelve month periods. Discussion with the local infection control teams is ongoing to try to understand whether this apparent increase is real and if so the reason for this.
- 5.4 How best to control the nosocomial transmission has been hotly debated over the years as the numbers of MRSA infections reported have increased sharply in several countries. Two recent papers argue the case for active surveillance cultures combined with contact precautions. Farr and colleagues point out that the Centers for Disease Control's 17 year old recommendation of contact precautions to control MRSA spread is insufficient without active surveillance<sup>6</sup>. In May 2003, the Society for Healthcare Epidemiology of America (SHEA) published its 'Guideline for Preventing Nosocomial Transmission of Multidrug Resistant Strains of *Staphylococcus aureus* and *Enterococcus*'<sup>7</sup>. This paper provides a comprehensive and well-referenced review of the evidence for the role of a range of factors on MRSA acquisition. They state that frequent antibiotic therapy provides an environment in which antibiotic resistant organisms can flourish. But it is the spread of the organism between patients, sometimes via the hands of staff, which results in transmission. The authors comment that 'it is unlikely that hand hygiene by itself will result in the control of antibiotic resistant pathogens such as MRSA...'. Evidence, including the results from modelling studies, is presented to show that the most effective way to control antibiotic resistant organisms, including MRSA, is by a combination of active surveillance to detect the reservoir of infection, ie asymptomatic, colonized patients, combined with contact precautions. Active surveillance of high risk patients being admitted to high risk units is in place in hospitals in Scotland and the rest of the United Kingdom, but it is the comprehensiveness and intensity of the active surveillance approach advocated by SHEA which is striking. Evidence is presented that the active surveillance and control approach when implemented across a group of hospitals in a region can have an enormous impact on MRSA transmission in hospitals in the region. The review also includes economic studies of the cost of MRSA infections demonstrating the savings to be had in the long term from control of these infections. It will be of interest to see how widely the approach will be, or can be, adopted in the United States and whether such an approach can reduce transmission rates in hospitals with high endemicity.
- 5.5 Current United Kingdom Guidelines for the control of methicillin-resistant *Staphylococcus aureus* infection in hospitals<sup>8</sup> are being revised.

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