



First Report on MRSA Blood Cultures in Northern Ireland

NORTHERN IRELAND

April 2001 - March 2002

1. Introduction

It is well known that methicillin resistant *Staphylococcus aureus* (MRSA) infections are a problem in hospitals worldwide. Patients who become infected with methicillin resistant strains of *Staphylococcus aureus* (*S aureus*) tend to have more severe infections when compared to those infected with sensitive strains. Their treatment is more expensive, longer, more toxic and can potentially have more side effects. Transmission of MRSA can occur among other patients and staff.

In more general terms, a rise in the prevalence of MRSA strains threatens to increase the numbers of organisms resistant to a range of other currently effective antibiotics, which has obvious implications for treatment of infections. The cost of treating patients would increase, their length of hospital stay could increase and planned hospital activity, e.g. surgery could be disrupted, leading to overall increased costs for healthcare services which are already operating on limited budgets.

Following the Department of Health (London)'s mandatory requirement for MRSA bacteraemia rates to be reported from 1 April 2001, the Department of Health, Social Services and Public Safety in Northern Ireland have recommended that a similar strategy be introduced in Northern Ireland from April 2002¹. It is hoped that surveillance of MRSA infections will identify changing frequencies and rates of infections, and allow for

discussion of best practice amongst Infection Control Teams in the Province.

This is a preliminary report on the surveillance of MRSA bacteraemia in Northern Ireland, which has enabled the data collection process and analysis to be piloted prior to the formal start of the scheme on 1 April 2002. Data collected on a quarterly basis from "acute Trusts" have been collated and analysed by CDSC (NI). This report relates to the one-year period from 1 April 2001-31 March 2002.

2. Main Points

Since this is the first collection of such data in the Province, results need to be viewed with **extreme caution**. The total of MRSA blood cultures reported by Trusts is a relatively crude measure of MRSA bacteraemias and the following points should be noted:

- MRSA blood culture rates are not a direct measure of MRSA bacteraemia rates, since many blood cultures may have been taken from one patient during a single episode of disease. Also, it cannot be assumed that every isolate is responsible for infection of a patient. For example, the needle used to extract blood may have become contaminated with bacteria present on the surface of the skin.

- As mentioned above, more than one MRSA blood culture from one patient may have been counted in the dataset. Data collected on ‘patient episodes’ should ensure that only one MRSA positive blood culture set from one patient is counted within a 14-day period (this period is arbitrarily considered to represent one episode of disease). **These data are likely to provide a more accurate reflection of the rates of *S aureus* and MRSA bacteraemias.** However, it still remains the case that not all cases recorded can be assumed to be true bacteraemias.
- The figure may also include isolates which were acquired before admission to the hospital, either in the community, or in another hospital prior to transfer.
- Patients whose infections were acquired in one hospital, and were subsequently transferred to another hospital, either within the same Trust or to another Trust, may also have been counted more than once.
- Many compounding factors will influence rates within Trusts. For instance, Trusts with different clinical mixes, patient profiles and specialties will have differing proportions of patients at high risk of MRSA infection. For example, a hospital with a specialised renal unit would treat high numbers of patients who are at increased risk of infection.
- Episodes of bacteraemia relating to patients resident in non-acute Trusts, e.g., in long-stay facilities in community Trusts, may have been omitted from these analyses in some cases. In other cases, such patients may have been transferred to acute Trusts and therefore were counted.

The rate of MRSA blood cultures per 1000 occupied bed days varied from 0.023 to 0.433 for the 1-year period, with an overall rate of 0.196.

In all Trusts, the number and rate of MRSA patient episodes were equal to or lower than the number and rate of MRSA blood cultures. The rate of MRSA patient episodes per 1000 bed days varied from 0.023 to 0.255 for the 1-year period, with an overall rate of 0.124. **Figures for patient episodes are generally considered to more accurately reflect the actual levels of MRSA bacteraemias.**

Although MRSA blood cultures are currently considered to be the best available indicator of MRSA infection and therefore a measure of MRSA prevalence in hospitals, measurement of MRSA patient episodes may provide a more accurate reflection of true values. In Northern Ireland it is hoped to continue collecting data on both variables.

The collection and analysis of data from all Northern Ireland acute hospital Trusts will enable each Trust to review and monitor their own rates in the context of the entire Province, and the use of comparable datasets and methods of analyses will allow cautious comparison with the results of similar schemes in England^{2,3,4} and Scotland^{5,6}. It should be remembered that the purpose of the monitoring process is to identify changes **within** Trusts, in order to inform future policy and allow for discussion of best practice amongst Infection Control Teams in the Province.

3. Data Sources and Analyses

Data provided by Trust Chief Executives were collected from 12 acute Trusts and entered into a Microsoft Access 2000 database. Analyses were carried out using Microsoft Access 2000 and Microsoft Excel 2000. The dataset and definitions are shown in Table 1 below:

Table 1: Definitions of variables in the dataset

Variable	Source
Trust Activity	Trust records
Total number of <i>S aureus</i> BC sets	Laboratory records
Total number of MRSA BC sets	Laboratory records
Total patients with <i>S aureus</i>	Laboratory records
Total patients with MRSA	Laboratory records

A blood culture set (BC set) is defined as a sample arising from a single venepuncture, irrespective of the number of bottles tested.

Trust Activity used for calculating rates was the daily average occupied beds.

Total *S aureus* BC is defined as the total number of positive BC sets with one or more bottle(s) positive for growth of *S aureus*.

MRSA BC is defined as the total number of *S aureus* BC sets with one or more bottle(s) positive for growth of MRSA.

Total patients with *S aureus* (PE) is defined as the total number of patients whose specimens were collected within the quarter, one or more of whose blood culture sets grew *S aureus*. If repeat specimens were collected from a single patient, and the patient was considered to have had two episodes of disease, then they should be counted as two patients. As an arbitrary measure, if positive blood culture sets are collected more than 14 days

apart, they should be considered as reflecting different episodes.

Total patients with MRSA (PE) is defined as the total number of patients whose specimens were collected within the quarter, one or more of whose blood culture sets grew MRSA. If repeat specimens were collected from a single patient, and the patient was considered to have had two episodes of disease, then they should be counted as two patients. As an arbitrary measure, if positive blood culture sets are collected more than 14 days apart, they should be considered as reflecting different episodes.

4. Results

4.1 Mandatory MRSA Bacteraemia Surveillance: Incidence

4.1.1 *S aureus* Blood Cultures

- Data relating to the total number of *S aureus* blood cultures was available for all 12 reporting Trusts for all 4 quarters of the surveillance period.
- The total number of *S aureus* blood cultures which were reported during the surveillance period was 859 (see Table 2). The highest quarterly number was reported between July and September 2001 (n=238, data not shown).
- *S aureus* blood cultures comprised 11.3% of all positive blood cultures in all Trusts. Values for individual Trusts ranged from 5.4% to 17.3% (data not shown).

4.1.2 MRSA Blood Cultures

- All *S aureus* blood cultures are tested for susceptibility to methicillin. The highest quarterly number of MRSA blood cultures was also reported between July and September 2001 (n=101, data not shown), with a total of 359 being reported during the surveillance period (see Table 2).

- The proportion of *S aureus* positive blood cultures which were tested and found to be MRSA varied from 27.3% to 56.5% (see Table 2) during the surveillance period. For all reporting Trusts (n=12), the overall Northern Ireland proportion was 41.8%.

Table 2: *S aureus* and MRSA blood cultures, and proportion of *S aureus* blood cultures which were MRSA, April 2001 - March 2002, Northern Ireland

Trust Name	SA BC	MRSA BC	MRSA BC/SA BC %
Altnagelvin Area Hospital	73	36	49.3%
Belfast City Hospital	219	90	41.1%
Causeway Hospital	22	11	50.0%
Craigavon Area Hospital	48	15	31.3%
Down Lisburn	25	11	44.0%
Green Park Healthcare	7	2	28.6%
Mater Infirmorum	62	35	56.5%
Newry & Mourne	22	6	27.3%
Royal Group of Hospitals	163	78	47.9%
Sperrin Lakeland	27	10	37.0%
Ulster Community & Hospitals	40	17	42.5%
United Hospitals	151	48	31.8%
Northern Ireland	859	359	41.8%

Note:

- The total number of blood cultures positive for the presence of *S aureus* and MRSA will include repeat sets taken from one patient.
- The figure will also include isolates of *S aureus* which have originated from colonised patients.
- The figure may also include isolates which were acquired before admission to the hospital, either in the community, or in another hospital prior to transfer.
- Patients whose infections were acquired in one hospital, and were subsequently transferred to another hospital, either within the same Trust or to another Trust, may also have been counted more than once.

4.1.3 MRSA patient episodes (PE)

- Data collected on MRSA patient episodes (see definitions) resulted in a similar proportion of MRSA:*S aureus*. Data was submitted by 12 Trusts.

- During the surveillance period, 577 and 227 patient episodes of *S aureus* and MRSA respectively were reported by all reporting trusts.
- The proportion of *S aureus* patient episodes which were MRSA ranged from 25.0% to 55.2% (see Table 3). For all reporting Trusts (n=12), the overall Northern Ireland proportion was 39.3%.

Table 3: Proportion of *S aureus* patient episodes which were MRSA, April 2001 - March 2002, Northern Ireland

Trust Name	SA PE	MRSA PE	MRSA PE/SA PE %
Altnagelvin Area Hospital	53	22	41.5%
Belfast City Hospital	135	55	40.7%
Causeway Hospital	18	7	38.9%
Craigavon Area Hospital	37	13	35.1%
Down Lisburn	24	10	41.7%
Green Park Healthcare	6	2	33.3%
Mater Infirmorum	29	16	55.2%
Newry & Mourne	15	6	40.0%
Royal Group of Hospitals	100	40	40.0%
Sperrin Lakeland	20	5	25.0%
Ulster Community & Hospitals	40	17	42.5%
United Hospitals	100	34	34.0%
Northern Ireland	577	227	39.3%

Note:

- In general, where data were provided on patient episodes, the proportion of MRSA: *S aureus* patient episodes was similar to the proportion of MRSA: *S aureus* blood cultures.
- **It is likely that the figures for MRSA patient episodes more accurately reflect the proportion of MRSA bacteraemias, although it should still be noted that no clinical assessment has been taken into account, and therefore cannot be assumed to represent true infections.**

4.2 Mandatory MRSA Bacteraemia Surveillance: Rates

Rates per 1000 bed days were calculated as follows:

$$\text{Trust Rate} = \frac{\text{Numerator, eg, MRSA blood cultures April 2001-March 2002} \times 1000}{\text{Average daily occupied beds} \times 365^*}$$

Average daily occupied beds x 365*

*365 = number of days from 1 April 2001-31 March 2002

Poisson exact 95% confidence intervals were calculated around each Trust's rate using Microsoft Excel. In cases where no value is entered for the confidence interval of a particular Trust, it has been statistically impossible to calculate reliable 95% confidence intervals by this method.

4.2.1 *S aureus* blood cultures

- Rates for *S aureus* blood cultures ranged from 0.082 to 1.014 (see Table 4). The overall Northern Ireland rate for *S aureus* blood cultures taken was 0.469.

Table 4: Number and rate per 1000 bed days of *S aureus* blood cultures, April 2001-March 2002, Northern Ireland

Trust Name	SA BC	Rate	Lower 95% CI	Upper 95% CI
Altnagelvin Area Hospital	73	0.519	0.407	0.653
Belfast City Hospital	219	1.014	0.884	1.157
Causeway Hospital	22	0.237	0.148	0.358
Craigavon Area Hospital	48	0.267	0.197	0.355
Down Lisburn	25	0.254	0.165	0.376
Green Park Healthcare	7	0.082	0.033	0.169
Mater Infirmorum	62	0.766	0.588	0.982
Newry & Mourne	22	0.299	0.187	0.453
Royal Group of Hospitals	163	0.539	0.460	0.629
Sperrin Lakeland	27	0.277	0.182	0.403
Ulster Community & Hospitals	40	0.194	0.139	0.265
United Hospitals	151	0.586	0.496	0.688
Northern Ireland	859	0.469		0.502

4.2.2 MRSA blood cultures

Rates for MRSA blood cultures ranged from 0.023 to 0.433 (see Tables 5 & 6 and Figure 1). Rates for Northern Ireland, England and Scotland are shown in Table 5 below.

Table 5: MRSA blood culture rates (Northern Ireland) and MRSA bacteraemia rates (England and Scotland) per 1000 bed days, April 2001-March 2002

	Overall Rate	Lowest Trust Rate	Highest Trust Rate
Northern Ireland	0.196	0.023	0.433
England ⁴	0.17	0	0.66
Scotland ⁶	0.16	0	0.36

Note:

The figures quoted for England were based on Trust rates and refer to the same period of surveillance as Northern Ireland, i.e., April 2001 - March 2002. However, the hospital activity (denominator) refers to a different time period, since it is the most up-to-date dataset available (April 2000 - March 2001). Figures for Scotland were based on acute Trusts, one Health Care Trust and local Boards, and refer to the same time period of surveillance. Data for Scotland were taken from the routine laboratory reporting scheme.

Table 6: Number and rate per 1000 bed days of MRSA blood cultures, April 2001-March 2002, Northern Ireland

Trust Name	MRSA BC	Rate	Lower 95% CI	Upper 95% CI
Altnagelvin Area Hospital	36	0.256	0.179	0.354
Belfast City Hospital	90	0.417	0.335	0.512
Causeway Hospital	11	0.118	0.059	0.212
Craigavon Area Hospital	15	0.084	0.047	0.138
Down Lisburn	11	0.112	0.056	0.200
Green Park Healthcare	2	0.023	0.003	0.085
Mater Infirmorum	35	0.433	0.301	0.602
Newry & Mourne	6	0.082	0.030	0.177
Royal Group of Hospitals	78	0.258	0.204	0.322
Sperrin Lakeland	10	0.102	0.049	0.188
Ulster Community & Hospitals	17	0.083	0.048	0.132
United Hospitals	48	0.186	0.137	0.247
Northern Ireland	359	0.196	0.176	0.218

4.2.3 *S aureus* patient episodes (PE)

- Quarterly data relating to *S aureus* patient episodes (see definitions) was provided by all Trusts for the surveillance period.
- During this time, 577 patient episodes of *S aureus* bacteraemia were reported by all reporting Trusts (n=12). This compares with a figure of 859 *S aureus* positive blood cultures for the same period from all Trusts.
- Rates ranged from 0.070 to 0.625 (see Table 7), with an overall Northern Ireland rate of 0.315. This compares with a Northern Ireland rate of 0.469 *S aureus* blood cultures per 1000 bed days.

Table 7: Number and rate per 1000 bed days of *S aureus* patient episodes, April 2001-March 2002, Northern Ireland

Trust Name	SA PE	Rate	Lower 95% CI	Upper 95% CI
Altnagelvin Area Hospital	53	0.377	0.282	0.493
Belfast City Hospital	135	0.625	0.524	0.740
Causeway Hospital	18	0.194	0.115	0.306
Craigavon Area Hospital	37	0.206	0.145	0.284
Down Lisburn	24	0.244	0.156	0.363
Green Park Healthcare	6	0.070	0.026	0.153
Mater Infirmorum	29	0.358	0.240	0.515
Newry & Mourne	15	0.204	0.114	0.336
Royal Group of Hospitals	100	0.331	0.269	0.403
Sperrin Lakeland	20	0.205	0.125	0.316
Ulster Community & Hospitals	40	0.194	0.139	0.265
United Hospitals	100	0.388	0.316	0.472
Northern Ireland	577	0.315		

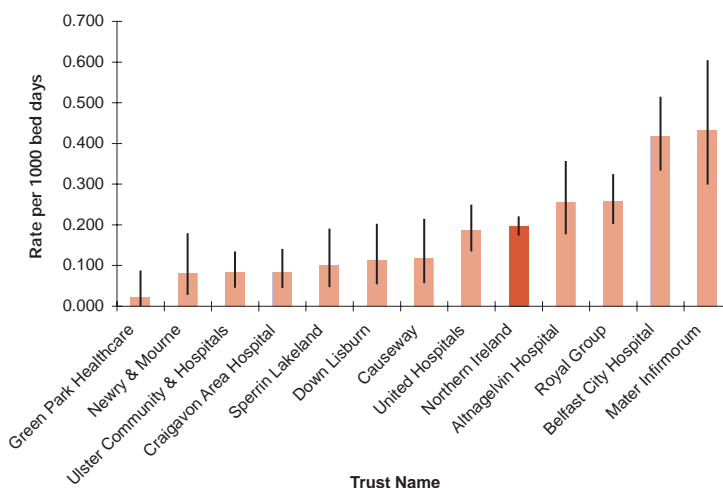
4.2.4 MRSA patient episodes (PE)

- Quarterly data relating to MRSA patient episodes was provided by all Trusts for the surveillance period.
- During this time, 227 patient episodes of MRSA bacteraemia were reported by all reporting Trusts. This compares with a figure of 359 MRSA positive blood cultures for the same period from all Trusts.
- Rates ranged from 0.023 to 0.255 (see Table 8), with an overall Northern Ireland rate of 0.124. This compares with a Northern Ireland rate of 0.196 MRSA blood cultures per 1000 bed days.

Table 8: Number and rate per 1000 bed days of MRSA patient episodes, April 2001-March 2002, Northern Ireland

Trust Name	MRSA PE	Rate	Lower 95% CI	Upper 95% CI
Altnagelvin Area Hospital	22	0.158	0.099	0.240
Belfast City Hospital	55	0.255	0.192	0.331
Causeway Hospital	7	0.075	0.030	0.155
Craigavon Area Hospital	13	0.072	0.039	0.124
Down Lisburn	10	0.102	0.049	0.187
Green Park Healthcare	2	0.023	0.003	0.085
Mater Infirmorum	16	0.198	0.113	0.321
Newry & Mourne	6	0.082	0.030	0.177
Royal Group of Hospitals	40	0.132	0.095	0.180
Sperrin Lakeland	5	0.051	0.017	0.120
Ulster Community & Hospitals	17	0.083	0.048	0.132
United Hospitals	34	0.132	0.091	0.184
Northern Ireland	227	0.124	0.108	0.141

Figure 1: Rate per 1000 bed days of MRSA blood cultures by Trust with 95% confidence intervals, April 2001 - March 2002, Northern Ireland



4.3 Routine Laboratory Reports

Data reported through mandatory MRSA bacteraemia surveillance and routine voluntary laboratory reporting were compared over the same time period. Data relating to routine laboratory reports could only be collected by reporting laboratory; however, further information was requested in order to more closely relate these data to those submitted by Trusts. Therefore, although not directly comparable, these datasets may in time allow auditing of the laboratory reporting system. Given time, they may give some indication of trends and numbers of MRSA blood cultures when both systems are reported together.

4.3.1 *S aureus* and MRSA blood cultures

- In most cases, the number of reports of *S aureus* and MRSA blood cultures recorded in the mandatory scheme are much higher than those reported through routine reporting (approximately 59% of the total number of MRSA blood cultures reported through the mandatory surveillance were recorded in CoSurv). This would, in part, be explained by the fact that mandatory reporting includes

multiple episodes from one patient.

- MRSA patient episodes from the mandatory reporting scheme were more comparable with routine laboratory reports.

Note:

- Comparison of these figures should be viewed with **caution**, but may indicate similar trends once more data become available.

5. Abbreviations

Surveillance period	1 April 2001 - 31 March 2002
BC	Blood culture (see definitions)
PE	Patient Episode (see definitions)
<i>S aureus</i>	<i>Staphylococcus aureus</i>
MRSA	Methicillin resistant <i>Staphylococcus aureus</i>
+ve	culture positive
CDSC (NI)	Communicable Disease Surveillance Centre (Northern Ireland)
DHSSPS	Department of Health, Social Services and Personal Safety
SA BC	<i>Staphylococcus aureus</i> blood culture

6. References

1. Department of Health, Social Services and Public Safety. Priorities for Action 2001/2002. Departmental Circular HS(PPM)2/2001.
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