

**REPORT ON METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS*
(MRSA) BLOOD CULTURES IN NORTHERN IRELAND: APRIL 2003-MARCH
2004 (YEAR 3)**

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EXECUTIVE SUMMARY

This report describes data collected on patients with episodes of *S aureus* (MRSA and MSSA; see Appendix A) bacteraemias reported between April 2003 and March 2004. *S aureus* bacteraemia reporting became a DHSSPS requirement from 1 April 2002, and figures relating to 2001-2002 and 2002-2003 were presented previously^{1,2}.

Between April 2003 and March 2004, rates of MRSA patient episodes per 1,000 occupied bed days in acute Trusts varied from 0.06 to 0.27 for the 1-year period, with an overall rate of 0.17. This compares with an overall rate of 0.13 and 0.12 during 2001-2002 and 2002-2003 respectively. The number of MRSA patient episodes increased from 228 in Year 1 to 307 in Year 3, representing an increase of 35%.

Rates of patient episodes of *S aureus* bacteraemia changed little between Year 1 and Year 2 of the surveillance programme, but increased from 0.304 (n=557) to 0.366 (n=677) in Year 3.

The proportion of patient episodes of *S aureus* bacteraemias reported as being methicillin resistant has increased since commencement of the scheme, and in Year 3 stands at 45.4%.

Rates of patient episodes of MRSA bacteraemia increased in eleven of the twelve Trusts when compared to Year 2 figures. A similar number of Trusts showed increases in rates of *S aureus* patient episodes.

The increasing trend in *S aureus* and MRSA patient episodes in the majority of Trusts may, in part, reflect improvements in reporting, although changes in rates in individual Trusts may be explained more effectively at a local level. However, the Year 3 results are considered to represent a real increase in the incidence rate of MRSA bacteraemia in Northern Ireland.

Analyses of these rates should be carried out with caution for the following reasons:

- It cannot be assumed that every isolate is clinically significant.
- Figures may also include isolates which were acquired before admission to the hospital, either in the community, or in another healthcare institution.
- 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 have been counted more than once.
- Many compounding factors will influence rates within Trusts. For instance, Trusts with different clinical mixes 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 and re-infection.
- Episodes of bacteraemia relating to patients resident in non-acute Trusts, eg., in long-stay facilities in community Trusts, may have been omitted from these analyses in some cases.

The collection and analysis of data from all Northern Ireland acute hospital Trusts enable each Trust to review and monitor their own rates in the context of the entire Province. The use of comparable datasets and methods of analyses also allow cautious comparison with similar results in England³ and Scotland⁴. The primary purpose of the monitoring process is to identify changes within Trusts, to inform future policy and allow for discussion of best practice amongst Infection Control Teams in the Province. Planned further development of the surveillance scheme should permit the collection of more clinically relevant information, and the production of more detailed interpretation of the effects of case mix, hospital activity and other risk factors on individual Trust's rates.

Figure A Rate per 1,000 occupied bed days of MRSA patient episodes by Trust with 95% confidence intervals, April 2003 – March 2004, Northern Ireland

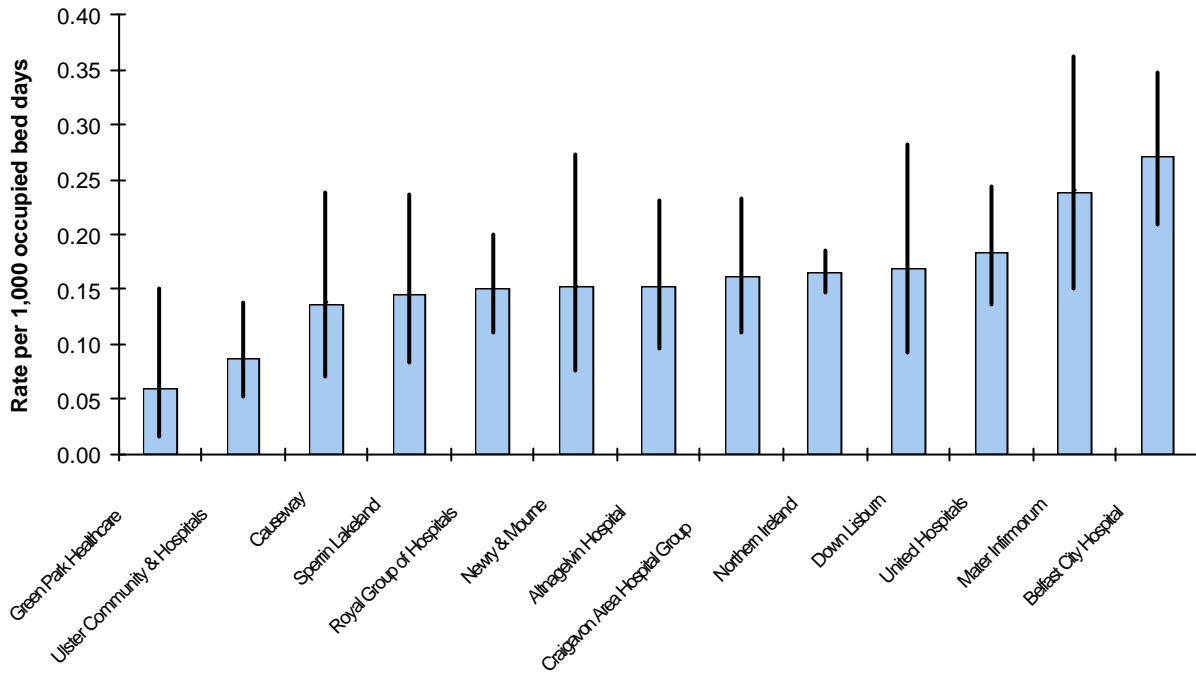
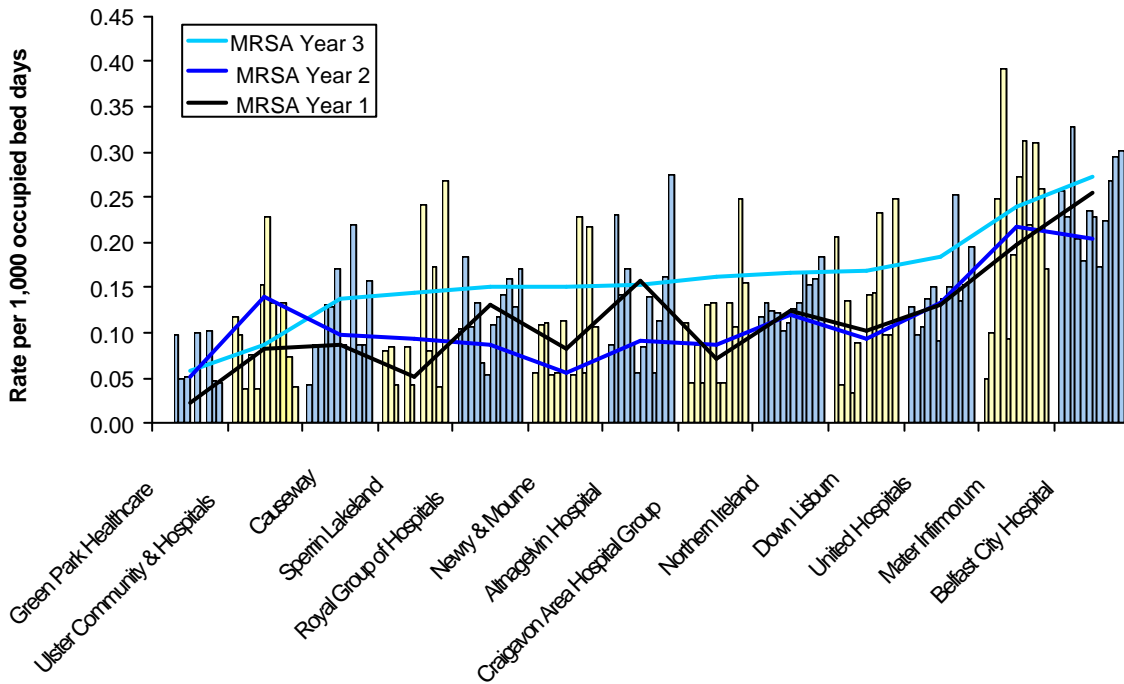


Figure B MRSA patient episodes per 1,000 occupied bed days, by Trust and Quarter, April 2001-March 2004, Northern Ireland



Each bar in Figure B represents sequential quarterly rates from April – June 2001 to January – March 2004. The lines represent overall rates for the periods as specified in the key.

THIRD ANNUAL REPORT ON METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA) BLOOD CULTURES IN NORTHERN IRELAND: APRIL 2003-MARCH 2004

1. Introduction

Following the Department of Health (London)'s mandatory requirement for MRSA bacteraemia rates to be reported from 1 April 2001, DHSSPS in Northern Ireland recommended that a similar strategy be introduced in Northern Ireland from April 2002. Previous reports on the surveillance of methicillin-resistant *Staphylococcus aureus* (MRSA) in Northern Ireland were prepared for circulation to all stakeholders, including Consultant Microbiologists, Trust Chief Executives, Infection Control staff and DHSSPS^{1,2}. This report relates to the one-year period April 2003-March 2004.

2. Data Sources and Analyses

Data were collected quarterly retrospectively from acute Trusts (see Table 1) by CDSC (NI). The variables and definitions, as agreed with data providers, have been described previously^{1,2}. Categorisation of acute Trusts was not undertaken in Northern Ireland due to the small number of Trusts involved. Rates per 1,000 occupied bed days and 95% confidence intervals were calculated as described previously^{1,2}.

Table 1 Reporting HSS Trusts within Northern Ireland

Trust Name	Hospitals
Altnagelvin Group HSS Trust	Altnagelvin, Spruce House, Waterside
Belfast City Hospital HSS Trust	Belfast City, Belvoir Park
Causeway HSS Trust ^a	Causeway, Robinson Memorial, Dalriada
Craigavon Area Hospital Group HSS Trust	Craigavon Area and PNU, Lurgan, South Tyrone ^b
Down Lisburn HSS Trust	Downe, Lagan Valley
Green Park Healthcare HSS Trust	Forster Green, Musgrave Park
Mater Infirmorum Hospital HSS Trust	Mater Infirmorum
Newry and Mourne HSS Trust	Daisy Hill
Royal Group of Hospitals HSS Trust	Royal Victoria, RBHSC, Royal Jubilee Maternity
Sperrin Lakeland HSS Trust	Tyrone County, Erne
Ulster Community and Hospitals HSS Trust	Ulster, Bangor, Ards
United Hospitals Group HSS Trust	Antrim, Braid Valley, Moyle, Mid-Ulster, Whiteabbey

^a Coleraine and Route Hospitals closed at the end of May 2001, with services being transferred to Causeway Hospital. For simplicity, data were collated under Causeway Hospital for all four quarters of 2001-2002.

^b South Tyrone Hospital transferred from Armagh and Dungannon HSS Trust to Craigavon Area Hospital Group HSS Trust in December 2000.

3. Results

3.1 Total Blood Cultures

3.1.1 During the surveillance period, 57,953 blood cultures were tested by reporting Trusts. This is a further increase of 228 (4.4%) on the figure recorded for Year 2 ($n=55,525$, data not shown). There has been a significant year-on-year increase in the total number of blood cultures taken since the scheme began, with an overall increase of 9.5% between Year 1 and Year 3.

3.1.2 The number of blood cultures tested in individual Trusts during the surveillance period ranged from 485 to 11,530 (Table 2).

3.2 Positive Blood Cultures

3.2.1 The total number of blood cultures testing positive for microbial growth during the surveillance period was 8,250 (Table 2). This is an increase of 9.8% on the number seen during Year 2 ($n=7,511$ data not shown), and an overall increase of 11% since surveillance began. Numbers increased significantly between Year 2 and Year 3 of the scheme.

3.2.2 During Year 3 the proportion of blood cultures taken by Trusts testing positive for the growth of microorganisms ranged from 10.7% to 16.2% (see Table 2). The overall figure for Northern Ireland increased from 13.5% in Year 2 to 14.2% in Year 3.

Table 2 Blood Culture Details by Trust, April 2003 – March 2004

Trust Name	Blood Cultures	Blood Cultures Positive	Positivity (%)
Altnagelvin Group	5,175	652	12.6
Belfast City Hospital	9,533	1,543	16.2
Causeway	2,577	324	12.6
Craigavon Area Hospital Group	5,457	718	13.2
Down Lisburn	1,990	304	15.3
Green Park Healthcare	485	52	10.7
Mater Infirmorum Hospital	2,636	421	16.0
Newry & Mourne	2,313	294	12.7
Royal Group of Hospitals	11,530	1,575	13.7
Sperrin Lakeland Trust	2,752	309	11.2
Ulster Community & Hospitals	5,964	861	14.4
United Hospitals Group	7,541	1,197	15.9
Northern Ireland	57,953	8,250	14.2

All rates are per 1,000 occupied bed days

Note:

-Total positive blood cultures (numerator) includes **all** microorganisms isolated from blood cultures, and as such will include not only true bacteraemias, but also non-clinically significant bacterial isolates, contaminants and fungal isolates.

-It will also include all blood culture sets taken from any patient which were positive for the presence of microbial growth, including any number of repeat sets taken from one patient during the same episode of disease. The figure therefore over-estimates the true figure for isolation rates in infected patients

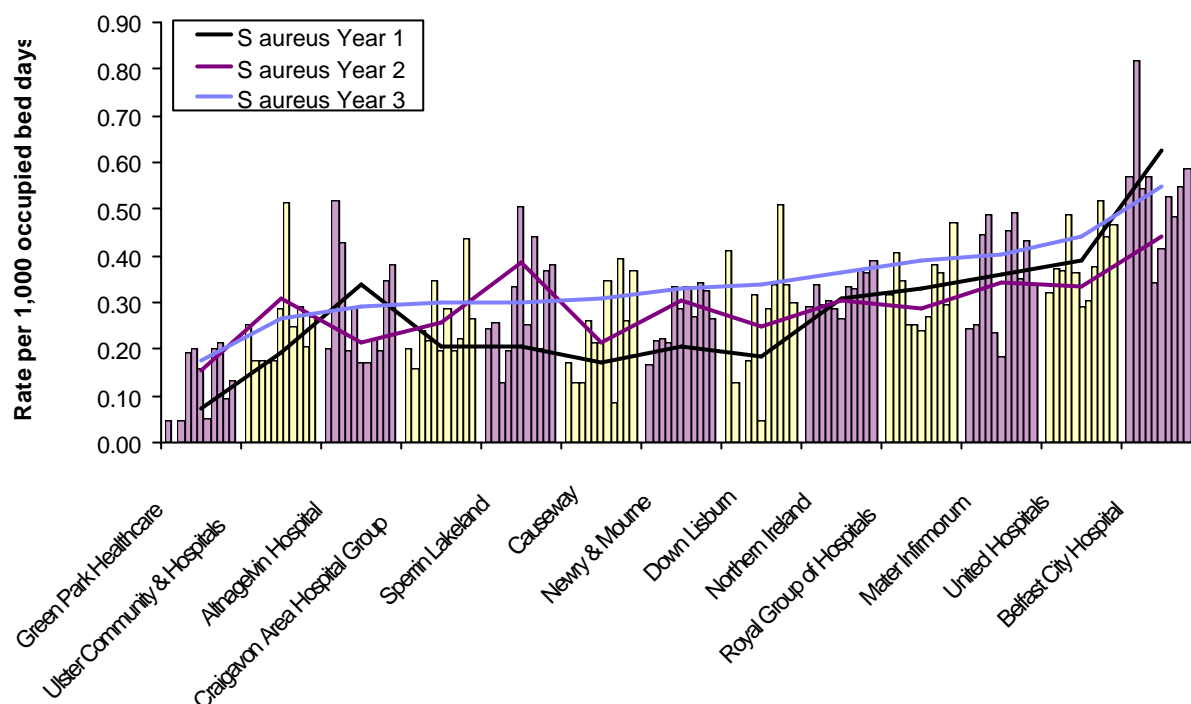
3.3 Episodes of *S aureus* Bacteraemia (MRSA and MSSA)

3.3.1 During the surveillance period, 677 patient episodes of *S aureus* bacteraemia (MRSA and MSSA, see Appendix A) were reported by all Trusts, compared with 557 and 563 episodes for Year 2 and Year 1 respectively (see Table 3).

3.3.2 The number of patient episodes of *S aureus* bacteraemia reported by Trusts during the period varied from 12 to 127, a wider range to that observed during Year 2 (12-100 episodes).

3.3.3 Trust rates ranged from 0.18 to 0.55 patient episodes per 1,000 occupied bed days with an overall rate of 0.37 (see Figure 1 and Table 3). This compares with a wider range of 0.15 to 0.44 and an overall rate of 0.30 during the previous year.

Figure 1 Rates per 1,000 occupied bed days of *S aureus* Bacteraemia by Trust and Quarter, April 2001-March 2004, Northern Ireland



Each bar in Figure 1 represents sequential quarterly rates from April – June 2001 to January – March 2004. The lines represent overall rates for the periods as specified in the key.

Table 3 Number and Rate of patient episodes of *S aureus* Bacteraemia (MRSA and MSSA) with 95% confidence intervals, April 2003-March 2004, Northern Ireland

Trust	Patient Episodes	Rate	Lower	Upper
Altnagelvin Group	42	0.29	0.21	0.40
Belfast City Hospital	127	0.55	0.46	0.66
Causeway	27	0.31	0.20	0.45
Craigavon Area Hospital Group	55	0.30	0.22	0.39
Down Lisburn	28	0.34	0.22	0.49
Green Park Healthcare	12	0.18	0.09	0.31
Mater Infirmorum Hospital	37	0.40	0.28	0.55
Newry & Mourne	24	0.33	0.21	0.50
Royal Group of Hospitals	119	0.39	0.32	0.47
Sperrin Lakeland Trust	33	0.30	0.21	0.53
Ulster Community & Hospitals	55	0.27	0.21	0.35
United Hospitals Group	118	0.44	0.37	0.53
Northern Ireland	677	0.37	0.39	0.34

All rates are per 1,000 occupied bed days

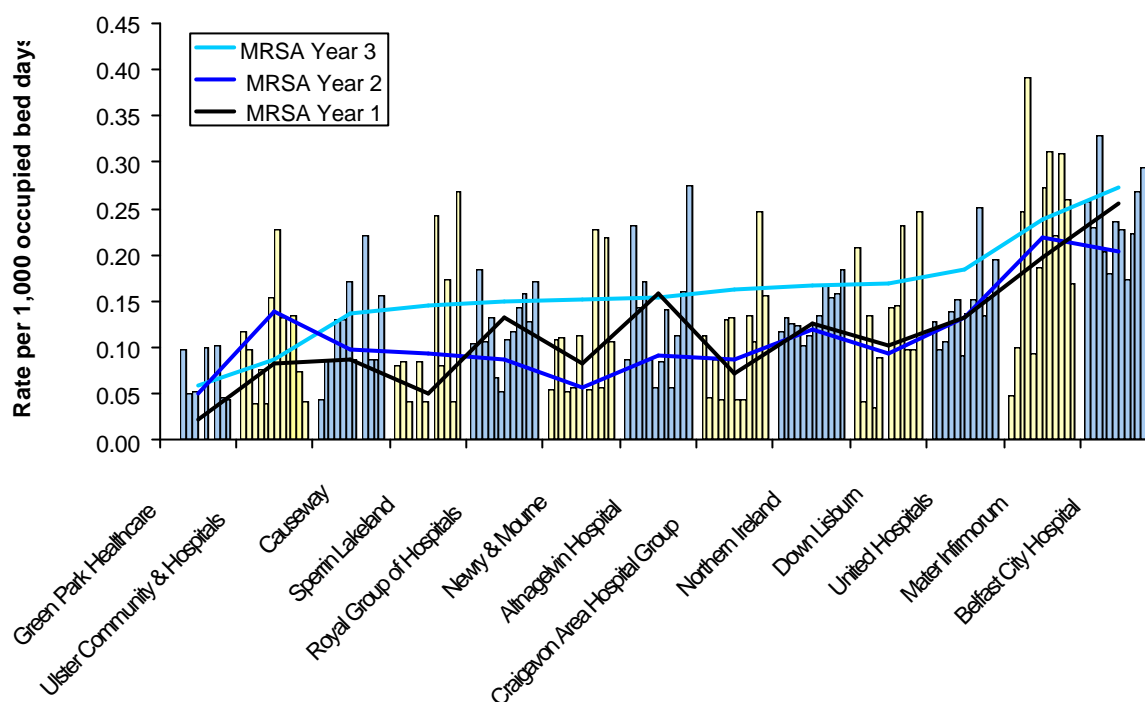
3.4 Episodes of MRSA Bacteraemia

- 3.4.1 During the surveillance period, 307 patient episodes of MRSA bacteraemia were reported by all trusts (Table 4). This compares with a figure of 218 for the previous year (data not shown), and represents a 41% increase in reporting.
- 3.4.2 The number of MRSA patient episodes reported by Trusts during the surveillance period varied between 4 and 63, a broader range than was observed during Year 1 (4-46 episodes).
- 3.4.3 Trust rates ranged from 0.1 to 0.27 episodes per 1,000 occupied bed days, with an overall rate of 0.17 (Figure 2, Figure 3 and Table 4). This compares with a range of 0.1 to 0.22 and an overall rate of 0.12 during the previous year, and represents a significant increase.
- 3.4.4 The proportion of *S. aureus* patient episodes which were MRSA ranged from 32% to 59% (see Table 5). The overall Northern Ireland proportion was 45.3%, an increase from the previous year's proportion of 39.1%.
- 3.4.5 The Northern Ireland rate of 0.17 is similar to that observed in England (0.18). The rate in Scottish Trusts has shown a decrease to 0.15 during Year 3, and is now the lowest of the UK rates shown in Table 6.

Table 4 Number and Rate of patient episodes of MRSA Bacteraemia with 95% confidence intervals, April 2003 –March 2004, Northern Ireland

Trust	Patient Episodes	Rate	Lower	Upper
Altnagelvin Group	22	0.15	0.10	0.23
Belfast City Hospital	63	0.27	0.21	0.35
Causeway	12	0.14	0.07	0.24
Craigavon Area Hospital Group	30	0.16	0.11	0.23
Down Lisburn	14	0.17	0.09	0.28
Green Park Healthcare	4	0.06	0.02	0.15
Mater Infirmorum Hospital	22	0.24	0.15	0.36
Newry & Mourne	11	0.15	0.08	0.27
Royal Group of Hospitals	46	0.15	0.11	0.20
Sperrin Lakeland Trust	16	0.15	0.08	0.24
Ulster Community & Hospitals	18	0.09	0.05	0.14
United Hospitals Group	49	0.18	0.14	0.24
Northern Ireland	307	0.17	0.15	0.19

Figure 2 Rate per 1,000 occupied bed days MRSA Bacteraemia, by Trust and Quarter, April 2001–March 2004, Northern Ireland



Each bar in Figure 2 represents sequential quarterly rates from April – June 2001 to January – March 2004. The lines represent overall rates for the periods as specified in the key.

Table 5 Proportion of *S aureus* Bacteraemias which were MRSA (%), April 2001–March 2004, Northern Ireland

	Year 1	Year 2	Year 3
Altnagelvin Group	46.8	43.3	52.4
Belfast City Hospital	40.7	46.0	49.6
Causeway	50.0	45.0	44.4
Craigavon Area Hospital	35.1	34.0	54.6
Down Lisburn	55.6	38.1	50.0
Green Park Healthcare	33.3	33.3	33.3
Mater Infirmorum	55.2	63.3	59.5
Newry & Mourne	40.0	18.2	45.8
Royal Group of Hospitals	40.0	30.2	38.7
Sperrin Lakeland Trust	25.0	24.3	48.5
Ulster Community & Hospitals	42.5	45.3	32.7
United Hospitals Group	34.0	39.8	41.5
Northern Ireland	40.5	39.1	45.4

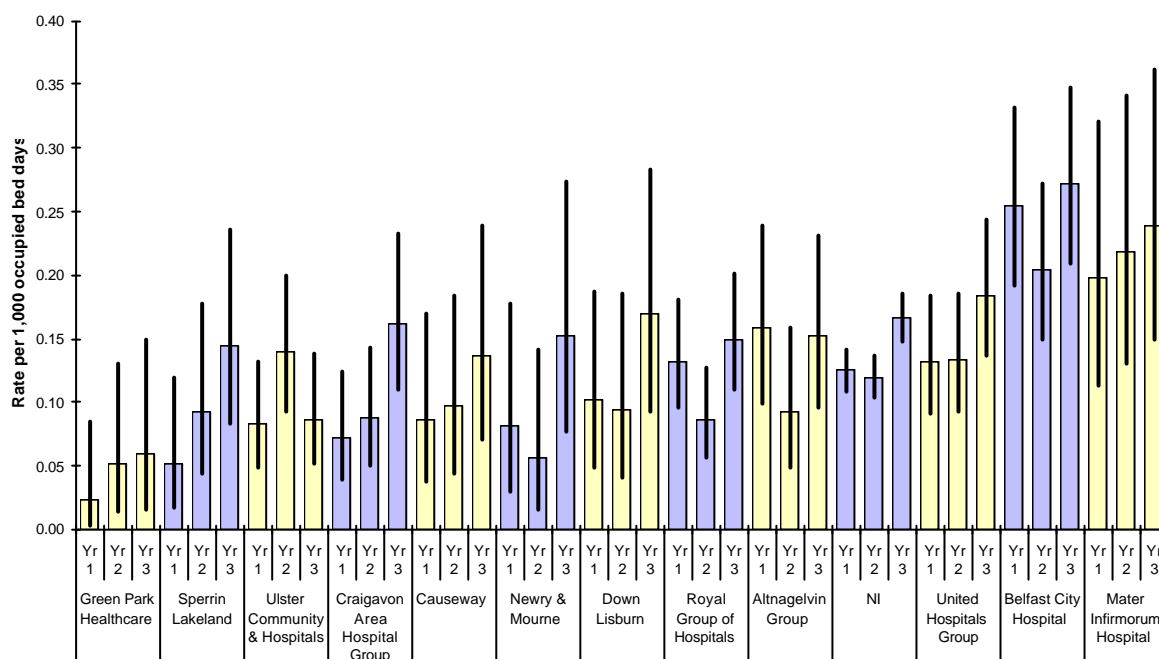
Table 6 MRSA bacteraemia rates per 1,000 bed days by year, April 2001 – March 2004

	Overall Rate		
	2001/2002	2002/2003	2003/2004
Northern Ireland	0.13	0.12	0.17
England³	0.17	0.17	0.18
Scotland⁴	0.16	0.17	0.15

Note:

The figures quoted for England for 2003/2004 were based on rates in 173 acute Trusts, and refer to the same time period. The hospital activity (denominator) refers to the time period April 2002 – March 2003. Figures for Scotland for 2003/2004 were based on 14 acute Trusts, one Health Care Trust and three island Boards, and refer to the same period of surveillance. Data for Scotland were taken from the routine laboratory reporting scheme.

Figure 3 Rate per 1,000 bed days of patient episodes of MRSA Bacteraemia by Trust with 95% confidence intervals, April 2001 – March 2004, Northern Ireland



4. Discussion Points

4.1 Blood Cultures

4.1.1 The increases in both the number of blood cultures taken, and in the proportion of blood cultures positive for microbial growth would be expected to result in higher numbers of *S aureus*-positive blood cultures being identified. They may, in part, have contributed to the increase in numbers of *S aureus* and MRSA blood cultures identified in most Trusts.

4.1.2 In a Trust where there is a larger proportion of patients who are more susceptible to blood infections, true blood culture rates would be expected to be higher.

4.1.3 Not all positive blood cultures will be clinically significant, and no clinical assessment has been considered regarding the dataset.

4.1.4 Interpretation of blood cultures rates can be carried out at Trust level only, as they are influenced by Trust practices and procedures, and patient characteristics.

4.2 Patient episodes of MRSA/*S aureus* Bacteraemia

- 4.2.1 The overall numbers of *S aureus* and MRSA patient episodes have shown a significant increase from Year 2. This is considered to represent a real increase in the incidence of *S aureus* and MRSA bacteraemia, as improvements in reporting, and the caveats outlined below could only partly explain this rise. A similar increase in *S aureus* and MRSA reports has been noted through the routine voluntary laboratory surveillance programme.
- 4.2.2 The figures reported by the Trust with the highest rate of MRSA patient episodes equate to 1.2 disease episodes per week.
- 4.2.3 During 2002/2003, there were 354,397 deaths and discharges from acute hospital facilities in Northern Ireland⁶, representing one patient with MRSA bacteraemia per 829 patients.
- 4.2.4 It is notable that in Scotland, where MRSA rates are now the lowest of the UK published results, the data is extracted from normal laboratory reporting. If this system had been used for mandatory surveillance in Northern Ireland, the overall MRSA rate would be 0.15 per 1,000 occupied bed days, compared with 0.17 using the current method.
- 4.2.5 The current method of collecting data for mandatory reporting in Northern Ireland includes all patient episodes of disease outside a 14-day period (see Appendix A). As no clinical assessment has been taken into account in relation to the dataset, it will include clinically significant and non-significant episodes.
- 4.2.6 No Trust categorisation was carried out in Northern Ireland. In England, rates were highest amongst Specialist Trusts and lowest in Single Specialty Trusts. In Specialist Trusts, the overall rate was 0.24 per 1,000 occupied bed days.
- 4.2.7 Although only one Specialist Trust is recorded for Scotland, it had a similarly low rate of MRSA bacteraemia, compared with the remaining 17 Trusts.

5. Future developments of *S aureus* reporting

- 5.1 Future datasets for mandatory MRSA surveillance may take a different format, allowing the collection of more detailed information on the clinical significance, source specialty and other relevant patient details. This may allow more detailed analyses of rates in relation to hospital activity, case mix, clinical significance and other factors.
- 4.2 It is hoped that these changes will make the dataset more meaningful, and improve its usefulness at Trust level for local surveillance and investigation.

5. Final Comments

- 5.1 The results presented here relating to Year 3 of the mandatory MRSA surveillance scheme show that the overall Northern Ireland incidence rate of MRSA bacteraemias has increased when compared with Year 2.
- 5.2 Results need to be viewed with **extreme caution**. The following points should be noted:
- 5.2.1 Trusts with different clinical mixes and specialties will have differing proportions of patients at high risk of MRSA infection. For example, Trusts which accommodate higher numbers of intensive care beds would be expected to have higher rates, since data suggest that 30% of all hospital-acquired bacteraemias occur in intensive care unit (ICU) patients⁵.

- 5.2.2 Reports of MRSA patient episodes from a Trust may relate to patients who became infected in, and were reported by, another Trust. Since data are collected without patient identifiers, the removal of duplicates is not possible.
- 5.2.3 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. These data are more likely to provide a more accurate reflection of the rates of *S aureus* and MRSA bacteraemias.
- 5.2.4 Episodes of bacteraemia relating to patients resident in non-acute Trusts, eg. in long-stay facilities in Community Trusts, may have been omitted from these analyses.
- 5.2.5 Detailed interpretation of these results can only be provided at Trust level, particularly with regard to quarterly variation within Trusts.
- 5.3 This dataset contains no information relating to patient outcome. The Northern Ireland Statistics and Research Agency (NISRA) have carried out an analysis of death certificates where *S aureus* and MRSA are mentioned⁷, using methodology similar to that used for similar work in England and Wales⁸ (see <http://www.nisra.gov.uk>).

Appendix A

Abbreviations

S aureus	<i>Staphylococcus aureus</i>
MRSA	Methicillin resistant <i>Staphylococcus aureus</i>
MSSA	Methicillin sensitive <i>Staphylococcus aureus</i>
+ve	culture positive
CDSC (NI)	Communicable Disease Surveillance Centre (Northern Ireland)
DHSSPS	Department of Health, Social Services and Public Safety

Definitions

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

Total blood cultures is defined as the total number of blood culture sets tested.

Positive blood cultures is defined as the total number of sets in which one or more bottle(s) tested positive for the presence of microbial growth.

'S aureus patient episodes' (SA PE) is defined as the total number of patients from whom BC set(s) collected during the quarter grew *S aureus*. If repeat specimens were collected from a single patient, and the patient was considered to have had two episodes of bacteraemia, 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.

'MRSA patient episodes' (MRSA PE) is defined as the total number of patients from whom BC set(s) collected during the quarter grew MRSA. If repeat specimens were collected from a single patient, and the patient was considered to have had two episodes of bacteraemia, 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.

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