1. Introduction

The prevention and control of healthcare associated infection (HCAI) is extremely high profile. Surveillance or monitoring of these infections is key to their control: we need to be able to measure them if we are to assess whether any impact has been made on controlling infection. Many hospitals in the country have participated in voluntary surveillance of key infections for many years. However, as part of the increased focus on control of HCAI, surveillance of some infections was made mandatory. This started off with *Staphylococcus aureus* (including methicillin resistant *Staphylococcus aureus*, MRSA) bacteraemia in April 2001 and was later extended to glycopeptide resistant enterococcal bacteraemia in October 2003, *C. difficile* associated disease in January 2004 and orthopaedic surgical site infection in April 2004. Reports have been published previously, six monthly for MRSA bacteraemia, annually for the other infections. This is the first time that all the mandatory surveillance reports have been brought together in one publication. This includes the national and regional picture, as well as the named Trust data for each area of surveillance, bar surgical site infection, where the timing of the report does not allow publication of the second year’s data yet. MRSA bacteraemia surveillance has had further development since its inception, so that enhanced information is now available. This includes information on whether the infection was likely to be present on admission, the main specialties affected in hospitals and the provenance of the patient. This information is important as it allows targeting of control efforts on the most affected areas. These developments were implemented in October 2005 and this is the first time this additional information is being published.

Data quality has been improving since the start of the mandatory surveillance programme, in terms of Trust participation and completeness of Trust data. This is particularly notable in MRSA bacteraemia surveillance. However, as with all such data, it is important to bear in mind the limitations of the data. It is tempting to compare one Trust with another, but Trusts are not always comparable. This might be for reasons of Trust composition (for instance, one Trust might include a unit which is not part of the make-up of most Trusts) or its case mix (a Trust with a particular specialism is likely to treat patients with more complicated illness). These differences will impact on rates of infection. Furthermore, the infection reported by a Trust may not have been acquired in that Trust. Work is underway to make the data more comparable, for instance specialty-level data are more comparable than whole Trust data and the classification of Trusts has been expanded to improve comparisons by size. In addition, identification of patients with infection on admission allows separation of these infections from those acquired during the admission. The fruits of these developments can be seen in this publication for the first time.

Last but not least, it is important to remember that not all HCAI are preventable. Some of these infections are the price we pay for advances in medicine which allow patients to survive who are unlikely to have survived their illness a few years ago. These advances range from life support in critical care units to treatments for cancers, leukaemias, HIV and other conditions where the patient may remain immunocompromised and vulnerable to infection. The aim of this surveillance is to focus control efforts so that some of these preventable infections can be avoided.
2. Key Points

2.1 Results of the fifth year of mandatory surveillance of MRSA bacteraemia, including data from the new enhanced surveillance scheme

- There were sizeable annual increases in MRSA bacteraemia reports up to 2003/04. Since then there have been two annual decreases.

- There were just over 3500 MRSA bacteraemia episodes reported during the period October 2005 to March 2006. This marks a slight fall in the numbers of bacteraemia against the previous year, but it would be premature to state that this indicates the beginning of a downturn in trend.

- The age distribution shows that the largest volume of MRSA bacteraemia are in the elderly, 69% occurring in the 65 years and over age group.

- Numbers of MRSA bacteraemia by trust in the six months from October 2005 to March 2006 varied between 0 and 81. The average number was 20 and the median 16. Six trusts reported no MRSA bacteraemia.

- Acute specialist and acute teaching trusts have contributed significantly to reductions in MRSA bacteraemia. In contrast, marked fluctuations or slight increases have been seen in the aggregate figures for trusts in the other categories during 2003 to 2006.

- Among the government office regions, London region, despite large decreases, remains the region with the highest numbers overall. A second region, Yorkshire and the Humber, now has significant decreases in MRSA bacteraemia. Elsewhere there were less marked changes, except in the North West region where the trend shows a significant increase. This is attributed to improvements in ascertainment and auditing laboratory reporting.

- Analysis of the date of detection of the MRSA bacteraemia in relation to the date of admission showed that the largest proportion of MRSA bacteraemia (67%) was detected on or after the second day of admission. The finding that 25% were detected on the day of admission or the day after is the subject of further investigation in an attempt to establish the risk factors for these cases. The remaining 8% of MRSA bacteraemia cases were detected in patients not admitted at the time of blood culture.

- Many bacteraemia are detected after the patient has been in hospital for some considerable time; 25% of MRSA bacteraemia were detected after the 24th day of admission.

- The majority of patients with MRSA bacteraemia were admitted to general medical, general surgical or care of the elderly wards. Among MRSA bacteraemia patients, 15% were in intensive care or a high dependency ward when their bacteraemia was detected. 8% of renal patients had MRSA bacteraemia.
2.2 Mandatory Surveillance of C. difficile Associated Disease 2005

- This report describes results from the second year of the mandatory C. difficile case reporting scheme in England. It also includes the data from the first year of the random sampling scheme, whereby strains from individual trusts are characterised.

- Reports were received from all 169 acute trusts treating adult patients in England, an improvement on 2004.

- There were 51690 reports of C. difficile disease in people aged 65 years and over in 2005, a 17.2% increase on 2004.

- Winter seasonality (highest numbers of reports in January-March and October-December) was not as pronounced as in 2004.

- There is some indication that the numbers of case reports have decreased over the four quarters of 2005. It is too early to assess the causes of this apparent trend.

- Rates are highest in small acute trusts.

- The predominant strain in referrals to the Anaerobic Reference Laboratory prior to the random sampling scheme was type 001. However, non-001 types predominate in the random sampling scheme, specifically types 106 and 027.

- The epidemiological and clinical significance of these findings remain unclear, as research has not yet shown a predictable relationship between type 027 and clinical severity.

2.3 The second year of mandatory Glycopeptide-Resistant Enterococcal bacteraemia surveillance: October 2004 to September 2005

- This report covers the second year of the mandatory surveillance of glycopeptide resistant enterococcal (GRE) bacteraemia, from October 2004 to September 2005.

- The numbers of reports are small: 757 bacteraemia compared to 628 in the first year’s report.

- Fifty-four trusts had no cases and only 21 trusts had more than 10 cases.

- Two-thirds of cases occurred in specialist trusts.

- These bacteraemia were concentrated in London.

2.4 Mandatory surveillance of surgical site infection in orthopaedic surgery: report of data collected between April 2004 and December 2005

- The Surgical Site Infection (SSI) report provides important data for both doctors/clinicians and patients about the risk of wound infection following surgery that can be used to inform and improve practice to reduce the risk of infection (target of “Winning Ways”). In addition this surveillance also contributes to tackling rates of MRSA, as SSI is a major cause of Staph aureus infections and many are caused by MRSA.

- Data have been collected on 79 120 procedures by 155 NHS Trusts between April 2004 and December 2005.
• In most Trusts the rates of SSI in orthopaedic surgery are low but increase with the number of risk factors present in the patient.

• Rates of SSI are highest in hip hemiarthroplasty. This is partly explained by patients undergoing these procedures being at greater risk of infection and because they tend to have a longer post-operative stay in hospital, increasing the chance that SSIs will be detected.

• Most of the SSIs reported affected the superficial layers of the wound, but approximately a quarter involved the deeper tissues.

• *Staphylococcus aureus* is recognised as a major cause of SSI and was responsible for half of the infections. Nearly a third of SSI were due to methicillin resistant *Staphylococcus aureus.*
3. Results of the fifth year of mandatory surveillance of MRSA bacteraemia, including data from the new enhanced surveillance scheme

Report of data collected between October 2005 to March 2006 with updating of data from April 2001
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3.1. Key points

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- Acute specialist and acute teaching trusts have contributed significantly to reductions in MRSA bacteraemia. In contrast, marked fluctuations or slight increases have been seen in the aggregate figures for trusts in the other categories during 2003 to 2006.

- Among the government office regions, London region, despite large decreases, remains the region with the highest numbers overall. A second region, Yorkshire and the Humber, now has significant decreases in MRSA bacteraemia. Elsewhere there were less marked changes, except in the North West region where the trend shows a significant increase. This is attributed to improvements in ascertainment and auditing laboratory reporting.

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- The majority of patients with MRSA bacteraemia were admitted to general medical, general surgical or care of the elderly wards. Among MRSA bacteraemia patients, 15% were in intensive care or a high dependency ward when their bacteraemia was detected. 8% of renal patients had MRSA bacteraemia.
3.2. Introduction

Laboratories based in NHS trusts have contributed data on significant infections caused by a range of organisms, including *Staphylococcus aureus*, to the HPA and, before that, to the Public Health Laboratory Service over many years. This includes information such as age and sex, details of the organism and detection methods used, and antibiotic susceptibility results. Reporting to the HPA’s database is mainly electronic. Entry of data onto this voluntary reporting system by participating laboratories is continuous. This system demonstrated a year on year rise in *Staphylococcus aureus* bacteraemias from 1990 and concerns about this increase led the Health Minister to announce in October 2000 that the reporting of certain healthcare associated infections would become mandatory. This started with the mandatory surveillance of *Staphylococcus aureus* bacteraemias by all acute NHS Trusts in England in April 2001. Initially the surveillance data was published annually, but subsequently this was changed to six monthly. Following a user study in 2004, which indicated that many Trusts were already collecting additional information on these bacteraemias, the scheme was developed further during 2005 at the request of the Department of Health. These enhancements were launched in October 2005. This involves Trusts accessing a website to enter details about each MRSA bacteraemia episode detected in their Trust, such as patient details for each MRSA bacteraemia episode, information on the patient’s location, date of admission, consultant specialty, and care details at the time the blood sample was taken. This report updates previous MRSA bacteraemia publications, but also includes, for the first time, information from these developments to the system, such as where the infection was acquired. The named Trust data on MRSA bacteraemia infections since 2001 are in Annex 1.

Since the establishment of the mandatory surveillance of MRSA bacteraemia the Department of Health (DH) has set a target of a 50% reduction in the national total of MRSA bloodstream infections by 2008; a target set against the 2003/04 baseline. For details of the policy initiatives and delivery programme please go to www.dh.gov.uk web link to the DH. This target has been incorporated as a performance indicator in the Healthcare Commission’s annual health check of NHS Trusts.

3.3. Surveillance methods and interpretation

Methods, data collection, and analysis

One hundred and seventy-three NHS acute trusts contributed to the mandatory surveillance scheme for *Staphylococcus aureus* in the period from April 2005 to March 2006. Data were collected quarterly from each acute NHS trust in England by Health Protection Agency (HPA) Local and Regional Services Division (LARS) and transferred to the HPA’s Centre for Infections (CfI) for national analysis.

The Department of Health’s Healthcare Associated Infection Surveillance Steering Group was responsible for developing the original dataset for this mandatory surveillance scheme. Methodological and interpretative information, including a glossary of terms, is published elsewhere.

All analyses were performed according to the current configuration of trusts. Data from merged trusts were combined for pre-merger time periods. Regional analysis was performed using the English regional boundaries introduced in April 2002.

The latest available overnight bed occupancy data, for financial year 2004/2005 were derived from the KH03 dataset provided by the Department of Health (http://www.performance.doh.gov.uk/hospitalactivity/). These data were used to derive the denominators for rate calculations by trust and by region.

\[
\text{Trust rate} = \frac{\text{Number of MRSA bacteraemias for time period}}{\text{Average daily bed occupancy} \times \text{number of days in time period}} \times 10000
\]
Comparative data and trend analyses for the first four years of the surveillance scheme were based on these data.

This report is based on reports of *S. aureus* isolated from blood cultures in English acute trusts. These data are used to monitor trends in methicillin resistant *S. aureus* (MRSA) bacteraemias. Trusts are provided with feedback to allow them an opportunity to compare their own rates compared to the national data.

These data should not be used as the basis for decisions on the effectiveness of interventions in individual trusts without further investigations, as higher rates may be indicative of higher clinical activity or particular case-mix.

The methodology for collection, reporting and checking of the information published in this update on the mandatory MRSA bacteraemia scheme has been subject to quality assurance by a report advisory group that reviews the data quality and methodology used for the statistical analysis.

The introduction of the quality assurance process will have impacted on the ascertainment and reporting of MRSA bacteraemia in ways that are involved and difficult to quantify or estimate. Other things being equal, this will tend to have increased the reported numbers of MRSA bacteraemia.

In order to improve comparability of trusts, future reports will list all trusts using a detailed grouping which stratifies trusts by size and to some extent the case mix of patients: acute (non-specialist) trusts have been categorised as small, medium and large and the remainder as acute teaching, acute specialist and acute specialist children. In this report the Trust line listings identify both the previously used and this revised designation of categories in order to improve the extent to which the analyses may be stratified.

Data are provisional and will be updated as appropriate when new information (for instance, the bed occupancy figures for 2005 – 06) is available.
3.4. National, regional and trust picture

3.4.1 National trend in MRSA bacteraemia since 1990

MRSA bacteraemia reports under the voluntary surveillance system increased from 68 in 1990 to 3895 in 2000, prior to the beginning of the mandatory surveillance scheme in April 2001 (Figure 1). The voluntary surveillance system did not include all Trusts, whereas the mandatory surveillance system does. There were approximately 40% more MRSA bacteraemia reported under the mandatory scheme than under the voluntary scheme. All 173 NHS acute trusts in England contributed surveillance data. Since 2003, MRSA bacteraemia reports have not shown the increases previously observed.

![Figure 1: Trend in MRSA bacteraemia reports received via the voluntary and mandatory surveillance schemes in England, calendar year 1990 to 2005](image)

There were 3517 MRSA bacteraemia episodes reported during the period October 2005 to March 2006. This marks a slight fall in the numbers of bacteraemia against the previous year, but it would be premature to state that this indicates the beginning of a downward turn in trend.

The numbers of MRSA bacteraemia equate to an MRSA bacteraemia incidence rate of 1.7 per 10,000 occupied bed days. This did not change between the period April - September 2005 and the period October 2005 - March 2006.
Figure 2 shows for each number of bacteraemia how many trusts had this number of bacteraemia (each dot represents a Trust). The numbers of bacteraemia by Trust ranged from 0 to 81. Six trusts reported no MRSA bacteraemias during this six month period. 16% had six or less MRSA bacteraemia in 6 months. The median number of MRSA bacteraemias per trust for the period October 2005 to March 2006 was 16.

The introduction of mandatory reporting for both MRSA and methicillin susceptible Staphylococcus aureus (MSSA) bacteraemia greatly increased the ascertainment of MRSA, but there was an even larger increase in the reporting of MSSA. Previously the rise in MRSA bacteraemia under the voluntary surveillance system was assessed using the proportion of MRSA to total Staphylococcus aureus bacteraemia; hence the proportion of MRSA had increased from less than 5% of all Staphylococcus aureus bacteraemia in 1990 to more than 40% by 2001 (Figure 3). As both MRSA and MSSA numbers have increased, this way of measuring the impact of MRSA has become less useful and MRSA as a proportion of all Staphylococcus aureus bacteraemia has levelled out at around 40%.
3.4.2 Age and sex distribution

Most MRSA bacteraemia occur in people over 65, preponderantly in males (Figure 4).

![Figure 4. Age and sex distribution of MRSA bacteraemia, October 2005 to March 2006](image)

3.4.3 Regional distribution

The distribution of MRSA bacteraemia across the English health regions is shown in Figure 5. London has had the highest numbers of bacteraemia, but has also had the biggest reduction. A second region, Yorkshire and the Humber, now has decreases in MRSA bacteraemia. Elsewhere there were less marked changes, except in the North West region where the trend shows an increase. This is attributed to improvements in ascertainment and auditing laboratory reporting.

![Figure 7. Regional analysis of MRSA bacteraemia records](image)
Figure 6 shows the relative MRSA bacteraemia rate changes for the nine health regions. The two bar charts show the relative MRSA bacteraemia rate changes from the intervention time when the baseline for the target was set, i.e., six month period October 2003 - March 2004 to last six months (October 2005 – March 2006).

A positive MRSA bacteraemia relative rate changes indicates an increase in MRSA bacteraemia rate and negative MRSA bacteraemia relative rate changes shows a decline in MRSA bacteraemia rate from baseline, i.e. regions below zero have achieved overall rate reductions in MRSA bacteraemia and regions above zero have had increases in MRSA bacteraemia.
The change in annual MRSA bacteraemia numbers from 2003/04 to 2005/06 by health region is examined in Figure 7. This analysis shows that London has had the largest decreases, whilst Yorkshire and the Humber now also has trusts with marked decreases in bacteraemia numbers. The North West region shows a significant increase. The changes in the other regions were less marked.

**Figure 7. Change in MRSA bacteraemia numbers from 2003/04 to 2005/06 by government office region**

3.4.4 Trust distribution and type

Earlier results from the DH mandatory surveillance scheme for MRSA bacteraemia analysed trust numbers and rates under three categories: general acute, specialist and single specialty trusts.

In order to improve comparability of trusts, future reports will list all trusts using a more detailed grouping which stratifies trusts by size and to some extent the case mix of patients: acute (non-specialist) trusts have been categorised as small, medium and large and the remainder as acute teaching, acute specialist and acute specialist (children). In this report the Trust line listings identify both the previously used and this revised designation of categories in order to improve the extent to which the analyses may be stratified and maintains comparability with earlier reports.
The acute teaching and large acute hospitals are seen in Figure 8 to have higher rates of MRSA bacteraemia than small and medium sized acute trusts. Furthermore both the small and large acute trusts have experienced small increases in rates over five years of surveillance. In contrast, the group of acute teaching trusts had a marked reduction in rate in the last three years, having initially had the highest rate.

Although overall aggregation of the bacteraemia reports shows little movement towards the national target, this masks significant movement within specific types of trusts, some having achieved a greater than 50% reduction in the first year of the introduction of the performance indicator. Acute specialist and acute teaching trusts have contributed significantly to reducing MRSA bacteraemia in the NHS across England (Figure 9). By contrast, either marked fluctuation in rates or slight increases have been seen in the other trust categories, including in the small number of children’s acute trusts.

Figure 8. MRSA bacteraemia rate by trust category: April 2001 to March 2006

Figure 9. Relative MRSA bacteraemia rate changes in percentages by hospital type
3.5. Results from the first six months of enhanced surveillance of MRSA bacteraemia

Enhancements to MRSA bacteraemia surveillance were implemented in October 2005 as required by the Department of Health. This is the first report to contain information from these developments.

3.5.1 Timing of acquisition relative to admission

Two thirds of reported MRSA bacteraemia were acquired during the hospital admission (Table 1). One quarter were present on admission, indicating that they were unlikely to have been acquired on that admission. These may have been acquired during earlier healthcare exposure or in the community.

Table 1: Timing of detection in relation to presentation of patient to hospital.

<table>
<thead>
<tr>
<th>Timing of detection</th>
<th>Number of MRSA bacteraemia</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRSA detected on presentation to the trust*</td>
<td>283</td>
<td>8 %</td>
</tr>
<tr>
<td>MRSA bacteraemia diagnosed on the day of admission or the first day after admission</td>
<td>862</td>
<td>25 %</td>
</tr>
<tr>
<td>MRSA bacteraemia diagnosed after the second day of admission</td>
<td>2372</td>
<td>67 %</td>
</tr>
<tr>
<td>Total</td>
<td>3517</td>
<td></td>
</tr>
</tbody>
</table>

*Had not been admitted at the time the blood sample was taken

8% of patients were not admitted at the time the blood sample was taken; these included patients who were ‘regular attenders’ (for instance, attending renal dialysis units) or seen in Accident and Emergency (A&E) departments (Table 2).

Table 2

<table>
<thead>
<tr>
<th>Patients not admitted on the date the specimen was taken</th>
<th>Number of MRSA bacteraemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accident and Emergency only patients</td>
<td>148</td>
</tr>
<tr>
<td>Regular attenders</td>
<td>50</td>
</tr>
<tr>
<td>Outpatients</td>
<td>21</td>
</tr>
<tr>
<td>Day-patients</td>
<td>6</td>
</tr>
<tr>
<td>Records concerning samples not taken in an acute trust hospital</td>
<td></td>
</tr>
<tr>
<td>Primary Care Trust hospital</td>
<td>7</td>
</tr>
<tr>
<td>Private hospital</td>
<td>3</td>
</tr>
<tr>
<td>Other location e.g. on community wards</td>
<td>5</td>
</tr>
<tr>
<td>Records with no date of admission</td>
<td>6</td>
</tr>
<tr>
<td>Date of admission after specimen date</td>
<td>5</td>
</tr>
<tr>
<td>Blank patient category</td>
<td>14</td>
</tr>
<tr>
<td>Other as patient category</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>283</td>
</tr>
</tbody>
</table>
The proportion of patients acquiring the bacteraemia prior to or after admission did not vary greatly between the type of trust (Table 3). Admission with MRSA bacteraemia appears to be independent of hospital type and size. This finding is the subject of further investigation.

Table 3. Records of MRSA bacteraemia detected in different categories of trusts between October 2005 and March 2006

<table>
<thead>
<tr>
<th></th>
<th>MRSA detected on presentation to trust</th>
<th>Detected within 2 days of admission</th>
<th>MRSA bacteraemia diagnosed after the 2\textsuperscript{nd} day from admission</th>
<th>Total</th>
<th>Number of trusts in category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small acute</td>
<td>34 (9 %)</td>
<td>91 (25 %)</td>
<td>238 (66 %)</td>
<td>363</td>
<td>33</td>
</tr>
<tr>
<td>Medium acute</td>
<td>54 (7 %)</td>
<td>221 (28 %)</td>
<td>526 (66 %)</td>
<td>801</td>
<td>52</td>
</tr>
<tr>
<td>Large acute</td>
<td>138 (10 %)</td>
<td>337 (24 %)</td>
<td>922 (66 %)</td>
<td>1397</td>
<td>43</td>
</tr>
<tr>
<td>Acute specialist</td>
<td>-</td>
<td>6 (25 %)</td>
<td>18 (75 %)</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>Acute specialist</td>
<td>-</td>
<td>4 (33 %)</td>
<td>8 (67 %)</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>(children)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute teaching</td>
<td>57 (6 %)</td>
<td>203 (22 %)</td>
<td>660 (72 %)</td>
<td>920</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>283 (8 %)</td>
<td>862 (25 %)</td>
<td>2372 (67 %)</td>
<td>3517</td>
<td>173</td>
</tr>
</tbody>
</table>

Forty percent of MRSA bacteraemia were detected within 6 days of admission and 80% within 29 days, indicating that MRSA acquisition is often associated with long hospital stays (Figure 10). The range of hospital stay before the detection of the bacteraemia was 0-596 days, with a mean prior length of stay of 20 days.

Figure 10. Time between admission and detection of MRSA bacteraemia - cumulative

8% of MRSA bacteraemia detected by the reporting trust were seen in patients who had not been admitted and are therefore excluded from this graph.
Summary points

These points only relate to the subset of admitted patients (3234). Patients not admitted at the time their blood culture was taken are excluded from consideration here.

- During the period October 2005 to March 2006, 27% of admitted MRSA bacteraemia patients were admitted to the reporting trust with an existing MRSA bacteraemia. ‘Existing’ means the bacteraemia was detected on the day of admission or the day after.

- 73% of admitted MRSA bacteraemia patients had their MRSA bacteraemia detected on or after their second day in hospital and are therefore assumed to have acquired their MRSA bacteraemia during their current hospital admission.

- The range of hospital stay prior to detection of MRSA bacteraemia was 0 to 596 days: mean of 20 days.

3.5.2 Patient location prior to admission

The majority (74%) of patients with MRSA bacteraemia acquired during the admission were admitted from home, with a further 10% being transferred from another acute hospital and 5% from nursing homes (Figure 11).

Figure 11. Patient location prior to admission for patients with an MRSA bacteraemia detected 2 or more days after admission

N=2372
Patients who were likely to have acquired the bacteraemia prior to the admission were also mainly admitted from home (71%), although a higher proportion were admitted from nursing homes (16%) (Figure 12). Half the patients admitted from nursing homes had their MRSA bacteraemia detected within 2 days and therefore could be presumed to have developed the bacteraemia before admission.

### Figure 12. Patient location prior to admission for patients with an MRSA bacteraemia detected within 2 days of admission

- Home: 71%
- Nursing home: 16%
- Hospital: 8%
- PCT hospital: 1%
- Other location or unknown: 4%

N=862

PCT hospital = Primary Care Trust hospital

### 3.5.3 Hospital specialty

Most MRSA bacteraemia were concentrated in general medical, general surgical and Care of the Elderly (Table 4, Figure 13). The distinction is not always clear between general medicine and Care of the Elderly, given the age structure of the hospital population, and there is much overlap between these two specialties. When the MRSA bacteraemia distribution is compared with general hospital admissions across the specialties, there is a greater number of MRSA bacteraemia in nephrology than expected by admission activity, and lower in trauma and orthopaedics (Figures 13, 14).
Table 4. Number of MRSA bacteraemia records by specialty for the period October 2005 to March 2006; specialties are only shown where there are 5 or more records.

<table>
<thead>
<tr>
<th>Specialty under which MRSA was detected</th>
<th>Bacteraemia detected 2 or more days after admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>General surgery</td>
<td>444</td>
</tr>
<tr>
<td>Urology</td>
<td>66</td>
</tr>
<tr>
<td>Trauma and orthopaedics</td>
<td>124</td>
</tr>
<tr>
<td>Ear nose and throat</td>
<td>5</td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>29</td>
</tr>
<tr>
<td>Cardiothoracic surgery</td>
<td>51</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>7</td>
</tr>
<tr>
<td>General medicine</td>
<td>785</td>
</tr>
<tr>
<td>Care of the Elderly</td>
<td>318</td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>101</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>16</td>
</tr>
<tr>
<td>Cardiology</td>
<td>35</td>
</tr>
<tr>
<td>Thoracic medicine</td>
<td>12</td>
</tr>
<tr>
<td>Infectious diseases</td>
<td>5</td>
</tr>
<tr>
<td>Nephrology</td>
<td>93</td>
</tr>
<tr>
<td>Neurology</td>
<td>15</td>
</tr>
<tr>
<td>Paediatrics</td>
<td>21</td>
</tr>
<tr>
<td>Medical oncology</td>
<td>20</td>
</tr>
<tr>
<td>Clinical oncology (prev. radiotherapy)</td>
<td>10</td>
</tr>
<tr>
<td>Clinical haematology</td>
<td>54</td>
</tr>
<tr>
<td>Haematology</td>
<td>9</td>
</tr>
<tr>
<td>Critical care medicine</td>
<td>24</td>
</tr>
<tr>
<td>Not known/not listed/blank</td>
<td>101</td>
</tr>
<tr>
<td>Specialties with less than 5 MRSA</td>
<td></td>
</tr>
<tr>
<td>bacteraemia</td>
<td>27</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2372</strong></td>
</tr>
</tbody>
</table>
Figure 13. Ten most commonly recorded specialties for MRSA bacteraemia detected 2 or more days after admission

Figure 14. Hospital Episode Statistics admission data 2004-05 for the most common MRSA bacteraemia specialties

*Number of first finished consultant episodes.
Certain units of hospitals are not categorised as ‘specialities’ in the national Hospital Episode Statistics, but as ‘augmented care’. This category includes critical care and renal dialysis units. The majority of MRSA bacteraemia in this category occurred in Intensive Care Units and Renal Dialysis Units (Figure 15). Augmented care units account for 15% of MRSA bacteraemia.

**Figure 15.** Most commonly reported augmented care categories for MRSA bacteraemia detected 2 or more days after admission

<table>
<thead>
<tr>
<th>Augmented care category</th>
<th>Number of records</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU</td>
<td>350</td>
</tr>
<tr>
<td>HDU</td>
<td>50</td>
</tr>
<tr>
<td>Combined HDU &amp; ICU</td>
<td>50</td>
</tr>
<tr>
<td>Renal Unit</td>
<td>50</td>
</tr>
<tr>
<td>Cardio ICU</td>
<td>20</td>
</tr>
<tr>
<td>CCU</td>
<td>20</td>
</tr>
<tr>
<td>Neuro ICU</td>
<td>20</td>
</tr>
<tr>
<td>Liver Unit</td>
<td>20</td>
</tr>
<tr>
<td>Post Op Recov Unit</td>
<td>20</td>
</tr>
<tr>
<td>Liver ICU</td>
<td>10</td>
</tr>
</tbody>
</table>

**Key**
- ICU: General Intensive Care Unit
- HDU: High Dependency Unit
- Cardio ICU: Cardiothoracic ICU
- CCU: Cardiac Care Unit or Coronary Care Unit
- Neuro ICU: Neurological ICU
- Post Op Recov Unit: Post Operative Recovery Unit
3.6. Conclusions

*Staphylococcus aureus* bacteraemia surveillance is the longest running of the mandatory surveillance schemes in England, having started in 2001. This report marks its fifth year, but also includes for the first time the findings from enhancements to the surveillance which were introduced in 2005.

Prior to the beginning of the mandatory surveillance, reported MRSA bacteraemia numbers had been rising inexorably, from 68 reports in 1990 to 3895 in 2000. Mandatory surveillance brought in reports from trusts which did not previously report under the pre-existing voluntary system and this raised the number of reports by approximately 40%. Since then, numbers of reports have levelled out, despite improvements in case ascertainment and reporting, which would have been expected to raise the numbers still further.

A total of 3517 MRSA bacteraemia episodes was reported during the period October 2005 to March 2006. This marks a small decrease in the number of reports compared to the beginning of the mandatory surveillance scheme and a 2.5% decrease on the previous six months. Given the increasing quality assurance around the data, the levelling off after years of increases gives grounds for cautious optimism, although it is still too early to confidently assert that this marks a downturn in the trend. Although the overall figures for England do not show much of a fall, some trusts have made a significant impact on their numbers. The biggest impact is being seen in acute teaching hospitals, the Trust category that had most cases. Among the government office regions, London remains the region with the highest numbers overall, but has had sizeable reductions. A second region, Yorkshire and the Humber, also has trusts which are now showing marked decreases.

The new additional data collected since October 2005 add considerably to our knowledge of MRSA epidemiology nationally. They confirm what had been suspected for a while, that a significant proportion of the bacteraemia were likely to be present on admission. We cannot yet say whether these MRSA infections reflect acquisition previously in the same hospital, another hospital or nursing home, or community acquisition unrelated to health care. The suspicion in this country is that most of these cases are associated with healthcare activities and do not indicate true community acquisition. However, this requires further investigation.

These new data also show that many bacteraemia are detected after the patient has been in hospital for some considerable time and that some specialties, such as nephrology, contribute disproportionately to the MRSA bacteraemia burden.

Since the beginning of this mandatory surveillance much has been done to improve the quality of the data and its comparability. There is always a temptation to compare Trusts, but the caveats on the data preclude this on a global level. The new categorisation of Trusts, which includes size and elements of case mix, plus the provision of data at specialty level enable closer comparisons than before, although cognisance should still be taken of the limitations of the data.
3.7. References

1. Mandatory Department of Health scheme for total *Staphylococcus aureus* and MRSA bacteraemia surveillance introduced April 2001

2. Enhanced mandatory scheme for MRSA bacteraemia surveillance introduced October 2005
   [http://www.hpa.org.uk/infections/topics_az/staphylo/mandatory.htm](http://www.hpa.org.uk/infections/topics_az/staphylo/mandatory.htm)

3. National surveillance scheme for laboratory reported bacteraemia (voluntary participation via electronic laboratory system)

4. Hospital activity data derived from the average daily number of total occupied beds in NHS organisations in England (KH03: Bed availability and occupancies)

5. Hospital Episode Statistics data [www.hesonline.org.uk](http://www.hesonline.org.uk)
4. Mandatory Surveillance of C. difficile Associated Disease  2005
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4.1. Key points

- This report describes results from the second year of the mandatory *C. difficile* case reporting scheme in England. It also includes the data from the first year of the random sampling scheme, whereby strains from individual trusts are characterised.

- Reports were received from all 169 acute trusts treating adult patients in England, an improvement on 2004.

- There were 51,690 reports of *C. difficile* disease in people aged 65 years and over in 2005, a 17.2% increase on 2004.

- Winter seasonality (highest numbers of reports in January-March and October-December) was not as pronounced as in 2004.

- There is some indication that the numbers of case reports have decreased over the four quarters of 2005. It is too early to assess the causes of this apparent trend.

- Rates are highest in small acute trusts.

- The predominant strain in referrals to the Anaerobic Reference Laboratory prior to the random sampling scheme was type 001. However, non-001 types predominate in the random sampling scheme, specifically types 106 and 027.

- The epidemiological and clinical significance of these findings remain unclear, as research has not yet shown a predictable relationship between type 027 and clinical severity.
4.2. Introduction and methods

Mandatory surveillance of *Clostridium difficile* associated disease (CDAD) in people over the age of 65 years has been included in the healthcare-associated infection surveillance system for acute trusts in England since January 2004. This scheme is operated by the Health Protection Agency (HPA) on behalf of the Department of Health (DH). Data are collected quarterly from each of the 169 acute NHS trusts in England that treat patients over 65 years of age (the four specialist children’s trusts in England are excluded).

Acute NHS Trusts in England are required to report all cases of CDAD in patients aged 65 years and over. This applies whether *Clostridium difficile* is considered to have been acquired in that trust, in another hospital or in the community. Cases are defined as all diarrhoeal specimens that test positive for *Clostridium difficile* toxin where the patient has not been diagnosed with CDAD in the preceding four weeks. The criteria for testing for infection and reporting cases were defined by the National *Clostridium difficile* Standards Group and are described in Table 1. All acute Trusts are also required to participate in a random sampling scheme to enable strain characterisation. This began in January 2005.

This report describes the data collected during the second year of the mandatory surveillance scheme, January to December 2005. It also includes data from the first year of the random sampling scheme.

**Table 1: Criteria for testing and reporting for CDAD mandatory surveillance**

<table>
<thead>
<tr>
<th>Criteria for testing and reporting for CDAD mandatory surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microbiology laboratories should test diarrhoeal stools for evidence of CDAD from all patients over 65 years old who have not been diagnosed with CDAD in the preceding four weeks. This is regardless of the presence or absence or any specific risk factors. Diarrhoeal stools are defined as those that take the shape of their container. Non-diarrhoeal stools should not be tested for CDAD.</td>
</tr>
<tr>
<td>Laboratories should test specimens for <em>C. difficile</em> toxin using either an immunoassay detecting both toxin A and toxin B, or a neutralised cell cytotoxicity assay. The method used should be subject to appropriate quality assurance.</td>
</tr>
<tr>
<td>Cases of <em>C. difficile</em> are defined as any diarrhoeal specimen that tests positive for <em>C. difficile</em> toxin, where the patient has not been diagnosed with CDAD in the preceding four weeks.</td>
</tr>
<tr>
<td>All cases of <em>C. difficile</em> detected should be reported. The mandatory surveillance scheme does not distinguish between hospital and community-acquired cases; even cases considered to be community-acquired should be reported by the trust in which they are detected. Cases from patients in community and Primary Care Trust (PCT) hospitals, mental health trusts, nursing and residential homes, other NHS-run healthcare facilities and patients receiving independent healthcare should also be reported by the trust which processes the stool sample.</td>
</tr>
</tbody>
</table>

Trusts’ rates of CDAD were calculated as follows:

\[
\text{Trust rate} = \frac{\text{Number of } C. \text{ difficile reports from that trust for the time period } \times 1000}{\text{Total bed-days in that trust for patients 65 years and over for the time period}}
\]

The denominator represented the total number of nights spent in hospital by patients aged 65 years and over between January and December 2004 for each trust. This was calculated from Hospital Episode Statistics (HES) data.
Regional rates of *C. difficile* were the total figures for numerators and denominators from all acute trusts treating adult patients in the respective region.

Data are provisional and will be updated when the bed occupancy figures for the appropriate period are available.

In 2005, a new system for classifying NHS acute trusts was introduced by the as described in the MRSA bacteraemia surveillance section. Trusts are now categorised into one of six types: small acute, medium acute, large acute, acute specialist, acute teaching, and acute specialist (children).

### 4.3. Results – the national, regional and trust picture

#### 4.3.1 National

In 2005, reports were received from all 169 acute trusts treating adult patients in England. Two trusts did not provide complete data for one quarter. This marks an improvement on 2004, when these two trusts did not contribute any data. Three trusts reported no cases of CDAD, and two reported only one case (all five were acute specialist trusts).

51,690 cases of CDAD were reported through mandatory surveillance in 2005. Compared with the 44,107 cases reported in 2004, this represented a 17.2% increase in numbers, and an increase in the rate of CDAD from 1.88 to 2.21 cases per 1,000 bed-days in people aged 65 years and over from 2004 to 2005\(^2\). Most of this increase was seen in the first two quarters of 2005 – the number of cases reported between October-December in 2005 was very similar to that reported in October-December in 2004 (Figure 1). The highest numbers of cases were reported during the winter quarters (January to March and October to December), but this seasonality was not as pronounced as in 2004.

![Figure 1. *Clostridium difficile* reports from patients aged 65 years and over, received under the mandatory reporting scheme in England during 2004 and 2005](image-url)
4.3.2 Regional distribution

As expected, in most regions the numbers of reported cases of CDAD were highest in January to March 2005 (Figure 2). However, in four out of nine regions numbers progressively decreased over the four quarters of 2005. In three other regions, numbers progressively decreased with each successive quarter apart from the July to September quarter, when the number of CDAD reports was less than in the October to December quarter. In two regions (East Midlands and North East) there was no or little evidence of winter seasonality.

![Figure 2: Regional distribution of *C. difficile* reports from patients aged 65 and over, received under the mandatory reporting scheme in England 2005](image)

The health regions with the highest rate of *C. difficile* were the South West, Midlands and East of England (Table 2)

**Table 2: Number of *C. difficile* case reports per 1000 bed days in people aged 65 years and over by region in 2005**

<table>
<thead>
<tr>
<th>Region Name</th>
<th>Number of <em>C. difficile</em> reports per 1000 bed days in people aged 65 years and over in 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>North East</td>
<td>1.87</td>
</tr>
<tr>
<td>Yorkshire and the Humber</td>
<td>1.64</td>
</tr>
<tr>
<td>East Midlands</td>
<td>2.27</td>
</tr>
<tr>
<td>East of England</td>
<td>2.56</td>
</tr>
<tr>
<td>London</td>
<td>2.22</td>
</tr>
<tr>
<td>South East</td>
<td>2.45</td>
</tr>
<tr>
<td>South West</td>
<td>2.79</td>
</tr>
<tr>
<td>West Midlands</td>
<td>2.67</td>
</tr>
<tr>
<td>North West</td>
<td>1.63</td>
</tr>
</tbody>
</table>
4.3.3 Trust type

Numbers of *C. difficile* case reports

The number of reports per trust ranged from 0 to 1,312 with a mean of 306 and a median of 259 cases per trust per year in 2005 (Figure 3).

![Figure 3: Distribution of *C. difficile* reports in all acute NHS trusts in England](image)

*Fig. 3: Distribution of *C. difficile* reports in all acute NHS trusts in England*

*Fig. 3: Distribution of *C. difficile* reports in all acute NHS trusts in England*

*Fig. 3: Distribution of *C. difficile* reports in all acute NHS trusts in England*

*Fig. 3: Distribution of *C. difficile* reports in all acute NHS trusts in England*

*Fig. 3: Distribution of *C. difficile* reports in all acute NHS trusts in England*

Rates of *C. difficile* by trust type

Rates of *C. difficile* infection in people of 65 years and over according to trust type are shown in Table 3. Small acute trusts had the highest rate and acute specialist trusts the lowest. Large acute trusts had the highest number of cases.

Table 3: Number of *C. difficile* case reports per 1000 bed days in people aged 65 years and over by trust category in 2005

<table>
<thead>
<tr>
<th>Trust category</th>
<th>Number of <em>C. difficile</em> case reports per 1000 bed days in people aged 65 years and over in 2005</th>
<th>Total number of <em>C. difficile</em> cases per trust type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Small acute</td>
<td>2.42</td>
<td>7,044</td>
</tr>
<tr>
<td>2 - Medium acute</td>
<td>2.22</td>
<td>14,824</td>
</tr>
<tr>
<td>3 - Large acute</td>
<td>2.16</td>
<td>19,274</td>
</tr>
<tr>
<td>4 - Acute specialist</td>
<td>0.76</td>
<td>202</td>
</tr>
<tr>
<td>5 - Acute teaching</td>
<td>2.23</td>
<td>10,346</td>
</tr>
</tbody>
</table>

*Named trust data.*

This can be found in Annex 2.
4.4 The Random Sampling Scheme

4.4.1 Methods

The Random Sampling Scheme was introduced on 1st January 2005 as part of the Department of Health’s programme of mandatory surveillance of C. difficile infection. Its specific aims are to monitor the prevalence of different C. difficile strains in England, trends in the proportion of cases caused by these strains, and the susceptibility of C. difficile strains to specific antibiotics.

Previously, C. difficile strain identification was only performed when clinicians specifically requested this test from the Anaerobe Reference Laboratory (ARL), located in Cardiff. Usually, this formed part of a C. difficile outbreak investigation strain identification was requested to check if cases were linked. The random sampling scheme was introduced because of concerns that the numbers of specimens being referred to the ARL had dwindled over recent years, so that there was little information on whether prevalent strains and antimicrobial susceptibilities were changing.

All acute trusts in England are now required to submit C. difficile samples to the ARL in accordance with a national sampling schedule. Every 12 months, each acute trust is randomly allocated one week for random sampling. During that week, trusts should provide consecutive positive C. difficile samples (excluding multiple specimens from an outbreak) received in their laboratory, up to a maximum of ten. Following culture at local or regional level, C. difficile isolates are sent to the ARL. Strains are identified through a genomic analysis of intergenic spacer regions between 16S - 23S rDNA using a technique known as PCR ribotyping.

This report summarises results from the first 12 months of random sampling. However, these results also include data from samples submitted for outbreak investigation, which has continued alongside the random sampling scheme.
4.4.2 Results

During the first year of random sampling, 1004 cultures of putative \textit{C. difficile} positive stools were obtained from 143 trusts. \textit{C. difficile} isolates were successfully recovered and processed from 881 of these 1004 samples.

Figures 4 illustrates the proportions of cases caused by different strains of \textit{C. difficile} strains for samples received by the ARL during the first year of the random sampling scheme.

\textbf{Figure 4: PCR types of \textit{C. difficile} in hospital patients in England January-December 2005: samples from the random sampling surveillance scheme (n=881)}

* 200 isolates consisting of 22 different PCR ribotypes
Figure 5 illustrate the proportions of cases caused by different strains of *C. difficile* received by the ARL between 1995 and 2003; of note, these data represent samples referred on specific request to the ARL for investigation of a case or outbreak. Therefore, data in the two figures are not strictly comparable.

**Figure 5: PCR types of *C. difficile* in hospital patients in England and Wales: referrals to ARL 1995-2003**

These figures show that the predominant strain prior to the establishment of the random sampling scheme was type 001. However, there are three main types predominant in the random sampling scheme, types 001, 027 and 001, types 106 and 027 being more frequent than type 001.
4.5 Conclusions

4.5.1 The mandatory case reporting scheme

Reporting of CDAD cases in 2005 was more complete compared to 2004 – in 2005 all trusts reported some data, in 2004 three did not report at all. It is important to note that both under- and over-reporting of cases is likely to have occurred - findings from a survey of Directors of Prevention and Control in acute hospitals in England in late 2005 suggest that adherence to the testing and reporting criteria for mandatory CDAD surveillance varies between trusts.

Overall, the number of cases of CDAD in people over 65 years increased in 2005 compared to 2004. However, although the total number of cases reported in the winter quarters is still higher than in the summer quarters, this is less pronounced than in 2004, and figure 2 suggests a trend to decreasing numbers of cases of CDAD as the year progresses in some health regions. The apparent seasonality in some regions may reflect more admissions of vulnerable patients during the winter, allied to increased antibiotic use for the treatment of infections such as those of the respiratory tract.

CDAD rates were relatively similar in small acute, medium acute, large acute, acute teaching trusts. Only acute specialist trusts showed lower rates. Rates were highest in small acute trusts.

CDAD rates are influenced by many factors aside from the quality of infection prevention and control activities. At trust level, the rate of CDAD may be affected by the types of patients treated (the “case mix”) and the number of community (versus hospital-acquired) cases of CDAD included in a trust’s reports; for example, these may be higher for trusts located in areas in which there are several community hospitals or nursing homes.

Within regions, trust mix is varied with differing numbers and proportions of trusts in each of the categories listed above. Aside from the factors mentioned above, differences in regional rates may be due in part to the trust mix; for instance, regions with high rates of C. difficile may have a relatively greater proportion of small acute trusts, which show the highest average rates of C. difficile in people aged 65 years and over.

These and other factors mean that data, particularly those on rates, should be interpreted with care, taking the following into account:

- The recommendations from the National Clostridium difficile Standards Group may not have been followed consistently. The HPA is working closely with Trusts to improve both adherence with the reporting guidelines and ascertainment, where reports are incomplete or not returned.

- The CDAD cases reported by an acute Trust were not necessarily acquired in that Trust. The Standards Group recommended that C. difficile data should include source information for the specimen (e.g. hospital, community), providing a means of distinguishing hospital from community-acquired cases. It is apparent that Trusts may not be able to make this distinction. In the past it was considered that C. difficile acquired in the community was an unusual event. Anecdotally some trusts have reported that 18-30% of their Trust’s reports were not from patients in the acute Trust. This finding requires further investigation. The distinction between hospital and community acquired cases is difficult not least because many patients with CDAD will have had recent hospital treatment.

- The number of CDAD reports for an acute Trust will include reports of samples sent to that acute Trust’s laboratories from NHS healthcare facilities not run by an acute Trust (e.g. from PCT community hospitals, or General Practitioners). The use of HES data is the first step in identifying an appropriate denominator for the surveillance of
healthcare-associated infections in patients aged 65 years and over. However, the HES denominator data for each acute Trusts presented here includes only the bed-days for hospitals run by that acute Trust. The bed-days listed for each acute Trust therefore frequently do not adequately represent the volume of patients served by an acute Trust’s laboratories. The result is that some Trusts, in particular those that receive a large proportion of their samples from outside of their Trust, have higher rates of CDAD calculated than relates to the hospital inpatients.

- The bed occupancy figures used to derive the CDAD rates for 2005 are for patients aged 65 years and over from a period before the CDAD data (January to December 2004). This is the most recent denominator data available. A Trust’s rate may be affected if there has been a significant change in activity that is not yet reflected in the bed occupancy figure for 2005. The rates published here are provisional and will be updated when the bed occupancy figures for the appropriate period are available.

- All the bed occupancy figures used to calculate the rates apply only to overnight admissions. Consequently CDAD in patients who are not admitted overnight may make a Trust’s rate look falsely high, as these patients will feature in the numerator but not in the denominator.

- Specimens should be tested using toxin tests that detect *C. difficile* toxins A and B. There is some evidence that even recommended toxin tests may not detect all cases\(^3\). This may have resulted in a small number of CDAD cases not being recognised.

- Reports of *C. difficile* in patients receiving independent healthcare may be included in the *C. difficile* reports from some Trusts. This has been indicated where known. Further work is in progress to clarify this area of ascertainment and the extent to which these patients may have acquired their infection whilst in the community.

4.5.2 The random sampling scheme

The two sets of data used to derive the proportions of cases caused by different strains as shown in Figures 4 and 5 are not strictly comparable. Strains that are more likely to cause an outbreak may be better represented in the 1995-2003 period. Nevertheless, the ARL data suggest that the proportion of *C. difficile* infections caused by non-type 001 strains appears to have increased since 1995. There has been a particularly large increase in the proportion of cases caused by types 027 and 106.

The epidemiological and clinical significance of these findings remain unclear. As in a number of other countries, an increasing proportion of cases of CDAD in England appear to be due to type 027. This has given rise to understandable concerns – laboratory experiments have found that type 027 (also known as Nap1 in the USA) can produce ten times as much toxin as other strains of *C. difficile*, and some data from North American outbreaks suggest that mortality in outbreaks caused by this strain is higher than would normally be expected. However, type 027 does not always produce excessive amounts of toxin when tested in vitro, and there is some anecdotal evidence that infections caused by the strain are not predictably more severe. There is also little evidence on wider trends in the average severity of CDAD in England. It has been suggested that other genomic factors play a role in determining whether particular strains cause an “average” or “severe” clinical course.
4.6. References


4. Source of bed-days denominator data: Hospital Episode Statistics (HES), Health and Social Care Information Centre
5. The second year of mandatory Glycopeptide-Resistant Enterococci (GRE) surveillance

October 2004 to September 2005
Contents

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5.1. Key points

- This report covers the second year of the mandatory surveillance of glycopeptide resistant enterococcal (GRE) bacteraemia, from October 2004 to September 2005.

- The numbers of reports are small: 757 bacteraemia compared to 628 in the first year’s report.

- Fifty-four trusts had no cases and only 21 trusts had more than 10 cases.

- Two-thirds of cases occurred in specialist trusts.

- These bacteraemia were concentrated in London.

5.2. Introduction and Methods

Reporting of clinically significant GRE bacteraemia has been mandatory for NHS acute trusts in England since September 2003. This surveillance is operated by the Health Protection Agency on behalf of the Department of Health. Data are requested quarterly from each of the 173 acute NHS trusts in England.

The National Glycopeptide-Resistant Enterococcal Bacteraemia Surveillance Working Group recommended that the significance of blood cultures containing GRE should be assessed clinically. If a bacteraemia is found to be clinically significant and due to either GRE, or GRE and a second different organism(s), it should be reported as a GRE bacteraemia. Positive blood cultures from the same patient within 14 days of the initial culture are considered to be part of the original episode and should not be reported. Duplicate reports, more than 14 days apart, should be reported as these are considered to be a separate episode. Enterococci from blood cultures should be tested for susceptibility to the antibiotic vancomycin. Teicoplanin is not an acceptable alternative to vancomycin for these purposes.

5.3. Results

Between October 2004 and September 2005 the Health Protection Agency received 757 reports concerning GRE bacteraemia under the mandatory scheme from all 173 acute NHS trusts in England (although one trusts did not provide data for all four quarters). This is a 21% increase on the 628 reports received between October 2003 and September 2004 (corrected figures due to late reporting since the first report). 

119 trusts reported at least one case of GRE bacteraemia during the year, but only 21 trusts reported more than ten cases. 54 trusts reported no cases of GRE bacteraemia.

Figure 1 shows the bacteraemia reports by quarter. There is no apparent seasonality in reporting: the increase in reports between January and March 2005 was not observed in the same period in the previous year.
Figure 1. GRE bacteraemia reports received under the mandatory reporting scheme by quarter, October 2003 to September 2005

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Year 1: Oct 03 - Sep 04</th>
<th>Year 2: Oct 04 - Sep 05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct - Dec</td>
<td>127</td>
<td>154</td>
</tr>
<tr>
<td>Jan - Mar</td>
<td>162</td>
<td>228</td>
</tr>
<tr>
<td>Apr - Jun</td>
<td>167</td>
<td>196</td>
</tr>
<tr>
<td>Jul - Sep</td>
<td>172</td>
<td>179</td>
</tr>
</tbody>
</table>

Figure 2 shows the regional distribution of reports for each year of the mandatory surveillance scheme. London has had the highest number of reports in both years. An increase in reports was observed in seven out of the nine health regions; Yorkshire and the Humber and the South East regions observed decreases. A direct comparison of the number of reports across regions is not possible as there is considerable variability in regional population sizes. Within regions, trust mix is also varied with differing numbers of general acute, specialist and single specialty trusts.

Figure 2. Regional comparison of the first two years of the GRE bacteraemia surveillance scheme
NHS acute trusts have previously been categorised according to type, based on the trust types used originally for the *Staphylococcus aureus* mandatory surveillance scheme. The three types of trust (and number of trusts in each category) under this categorisation are:

- General acute trusts (109): trusts providing general acute healthcare services;
- Specialist trusts (45): trusts with specialist services which receive patients referred from other trusts for these services;
- Single specialty trusts (17): trusts undertaking health services for a particular specialty (e.g. orthopaedics).

The greatest number of reports was received from specialist trusts, although specialist trusts make up only 26% of the reporting trusts (Figure 3).

![Figure 3. GRE bacteraemia reports received under the mandatory reporting scheme by trust category: October 2004 to September 2005](image)

Applying the new trust clustering used in MRSA bacteraemia surveillance to the GRE bacteraemia data shows that the largest proportion of reports (58%) were received from acute teaching trusts, with large acute trusts making up 22% of reports (Figure 4). The types of trust (and number of trusts in each of these categories) are:

1 - Small acute (33)
2 - Medium acute (52)
3 - Large acute (43)
4 - Acute specialist (16)
4c - Acute specialist (children) (4)
5 - Acute teaching (25)
5.4. Conclusions

Compared to the numbers of MRSA bacteraemia, the numbers of GRE bacteramia are small. There has been an increase in the number of reports in the second year of the mandatory surveillance, observed across seven of the nine regions. However, almost a third of trusts did not have any GRE bacteraemia infections during the year. At the trust level, the number of GRE bacteraemia reports is affected by the case mix i.e. the types of patients treated which may be dependent on the specialist units which exist within a particular trust.

It should also be noted that the patient may have acquired the GRE infection in the community or while in another healthcare facility, but this aspect is not assessed in this scheme. Trusts are asked to report all GRE bacteraemia cases they have detected, whether or not they were considered to be acquired in their trust, in another hospital or in the community.
5.5. References

1. Letter from the Chief Medical Officer and the Chief Nursing Officer announcing the start of mandatory GRE bacteraemia surveillance, 2003 (32 kB)


3. Results of the first year of mandatory GRE bacteraemia reporting: October 2003 - September 2004, are published on the Department of Health website and on the HPA website CDR Wkly 2005 15 (34) (832 kB)
6. Mandatory surveillance of surgical site infection in orthopaedic surgery

Report of data collected between April 2004 and December 2005
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6.1. Key points

- This Surgical Site Infection (SSI) report provides important data for both doctors/clinicians and patients about the risk of wound infection following surgery that can be used to inform and improve practice to reduce the risk of infection (target of “Winning Ways”). In addition this surveillance also contributes to tackling rates of MRSA, as SSI is a major cause of *Staphylococcus aureus* infections and many are caused by MRSA.

- Data have been collected on 79,120 procedures by 155 NHS Trusts between April 2004 and December 2005.

- In most Trusts the rates of SSI in orthopaedic surgery are low, but increase with the number of risk factors present in the patient.

- Rates of SSI are highest in hip hemiarthroplasty. This is partly explained by patients undergoing these procedures being at greater risk of infection and because they tend to have a longer post-operative stay in hospital, increasing the chance that SSIs will be detected.

- Most of the SSIs reported affected the superficial layers of the wound, but approximately a quarter involved the deeper tissues.

- *Staphylococcus aureus* is recognised as a major cause of SSI and was responsible for half of the infections. Nearly a third of SSI were due to methicillin resistant *Staphylococcus aureus*.
6.2. Introduction

A voluntary scheme enabling hospitals in England to undertake surveillance of Surgical Site Infection (SSI) was established by the Public Health Laboratory Service and Department of Health in 1997. This has subsequently been developed as the Surgical Site Infection Surveillance Service (SSISS) under the Health Protection Agency. In June 2003 the Chief Medical Officer announced that surveillance of SSI in orthopaedic surgery would become mandatory from April 2004. The surveillance co-ordinated by SSISS was developed to accommodate the requirements of the mandatory orthopaedic surveillance. This report presents data from the surveillance of surgical site infection in orthopaedic surgery collected by NHS Trusts in England between April 2004, when the mandatory surveillance commenced, and December 2005. Data for individual Trusts for the first year of the mandatory surveillance was published in October 2005 and is available on the Department of Health website: [http://www.dh.gov.uk/assetRoot/04/12/28/84/04122884.pdf](http://www.dh.gov.uk/assetRoot/04/12/28/84/04122884.pdf)

Results for individual Trusts that are based on relatively small numbers of procedures may be imprecise. Trusts that have participated previously in SSISS may therefore have more robust information about their rates of SSI based on data they have collected over several years.

6.2.1 Requirements of the mandatory surveillance of SSI in orthopaedic surgery

All NHS Trusts where orthopaedic surgical procedures are performed are expected to carry out a minimum of three months surveillance in at least one of the four orthopaedic categories.

- Total hip (prosthesis) replacement
- Knee (prosthesis) replacement
- Hip hemiarthroplasty
- Open reduction of long bone fracture

A hip hemiarthroplasty is a surgical procedure in which the damaged or diseased head and neck of the femur are removed and replaced with a prosthesis. The procedure is commonly carried out on elderly patients who have fractured the neck of femur as a result of a fall. Open reduction of fracture is a surgical procedure to repair a fractured bone using plates, screws or rods to stabilise the bone.

Some Trusts include more than one acute hospital and may have chosen to collect data at one hospital only. Some Trusts, in particular paediatric specialist hospitals, only carry out procedures in the open reduction of long bone fracture category and the throughput was too small to enable them to participate in the surveillance.

6.2.2 Surveillance methods

Surgical site infections are defined as infections related to a surgical procedure that affect the surgical wound or deeper tissues handled during the procedure. SSI cannot be reliably identified from laboratory data alone as the diagnosis depends on the presence of signs and symptoms of infection in the wound. The surveillance to detect SSI therefore requires active monitoring of patients from the time of their operation until they are discharged from hospital.

The SSISS surveillance is focused on categories of surgical procedure, with each category containing a defined set of similar procedures. All patients undergoing a procedure in the chosen category during the selected surveillance period are included in the surveillance. A basic set of demographic data e.g. age, sex of the patient, together with some details about the operation itself e.g. duration of operation, are then collected for each eligible procedure. These patients are then followed up throughout their hospital stay to discover whether they develop an infection of their surgical wound that meets the criteria for a SSI. Currently there is no requirement to continue surveillance once the patient has been discharged from hospital.
and SSI that develop after the patient has been discharged from hospital are not included in these rates.

To ensure that as far as possible data collected in different Trusts are comparable, Trusts are expected to adhere to the standard method of collecting and reporting data described in the SSI surveillance protocol. They are required to participate in the surveillance for minimum three-month periods although they can chose to collect data for more than one period.

### 6.3. Rates of surgical site infection in orthopaedic surgery

A total of 155 NHS Trusts have contributed data on 79,120 orthopaedics operations for the mandatory surveillance of SSI in orthopaedic surgery between April 2004 and December 2005. Most Trusts have chosen to undertake surveillance in the categories for total hip and knee prosthesis (Table 1). In the first year of the mandatory surveillance over a third of Trusts collected data for at least 9 months.

| Table 1: Participation in mandatory surveillance of SSI in orthopaedics |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Total no. procedures        | Total no. procedures        | no. SSI                     | % infected                  |
| Total procedures            | 155                         | 79120                       | 1057                        | 1.34                        |
| Total hip prosthesis        | 119                         | 31717                       | 364                         | 1.15                        |
| Hip hemiarthroplasty        | 82                          | 9976                        | 390                         | 3.91                        |
| Knee prosthesis             | 118                         | 32224                       | 208                         | 0.65                        |
| Open reduction long bone fracture | 34                         | 5203                        | 95                          | 1.83                        |

**Note:** 113 Trust participated in more than one category of procedure

#### 6.3.1 Incidence of SSI

The percentage of operations that resulted in SSI (cumulative incidence) in the post-operative in-patient period for each category of surgical procedure is shown in Figure 1. This demonstrates that the rates of SSI in orthopaedic surgery are low, although they are underestimated since surveillance does not continue after the patient has been discharged from hospital.

Rates of SSI are highest following hip hemiarthroplasty procedures, which are most commonly undertaken to repair fractures to the neck of femur. This is partially explained by risk factors in these patients who are older (see Table 6) and are more likely to have underlying illness that affects their susceptibility to infection. In addition, these more vulnerable patients tend to stay longer in hospital post-operatively: their median length of post-operative stay is 14 days compared to a median of 7 days for elective total hip prosthesis. Therefore, since the surveillance currently only detects SSI that develops whilst the patient is still in hospital, the likelihood that SSI will be identified is increased in patients undergoing hip hemiarthroplasty.
It is possible to allow for length of post-operative stay by calculating the rate of SSI as an incidence density i.e. the number of SSI per 1000 post-operative days in hospital. The difference in risk of SSI between total hip prosthesis and hip hemiarthroplasty is reduced when this adjustment for length of post-operative hospital stay is made (Figure 2).

6.3.1.1 Incidence of SSI by risk group

The risk of developing SSI following a surgical procedure is affected by factors related to the general health of the patient, the type of operation and the procedure itself. The risk index is used to measure variation in these major risk factors and comprises a wound class of contaminated or dirty (indicating the likely microbial contamination of the wound), an American Society of Anesthesiologists (ASA) physical status classification of 3 or more (indicating the patient has a severe underlying systemic disease), and duration of operation greater than the time at the 75th percentile (based on US National Nosocomial Infection Surveillance system and UK SSISS data) indicating a more complex procedure and
increased opportunity for microbial contamination of the wound. Each operation is allocated a score of between 0 and 3 depending on how many of the three risk factors are present. Those with all three risk factors are at greatest risk of developing SSI.

Tables 2 to 5 show the cumulative incidence of SSI by category of surgical procedures and risk index group. The incidence of SSI increases with the number of risk factors present, although the number of operations in the higher risk index groups is small and the estimates correspondingly imprecise. Where data for one or more of the risk factors included in the index have not been provided a risk score cannot be calculated.

### Table 2. Cumulative incidence (pooled mean) of SSI in total hip prosthesis by risk index

<table>
<thead>
<tr>
<th>Risk index category</th>
<th>Number of Trusts</th>
<th>Number of operations</th>
<th>Number of SSI</th>
<th>Pooled mean rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>119</td>
<td>16007</td>
<td>130</td>
<td>0.8</td>
</tr>
<tr>
<td>1</td>
<td>117</td>
<td>8191</td>
<td>127</td>
<td>1.6</td>
</tr>
<tr>
<td>2 and 3</td>
<td>109</td>
<td>1469</td>
<td>48</td>
<td>3.3</td>
</tr>
<tr>
<td>unknown</td>
<td>109</td>
<td>6050</td>
<td>59</td>
<td>1.0</td>
</tr>
<tr>
<td>All</td>
<td>119</td>
<td>31717</td>
<td>364</td>
<td>1.1</td>
</tr>
</tbody>
</table>
Table 3. Cumulative incidence (pooled mean) of SSI in hip hemiarthroplasty by risk index

<table>
<thead>
<tr>
<th>Risk index category</th>
<th>Number of Trusts</th>
<th>Number of operations</th>
<th>Number of SSI</th>
<th>Pooled mean rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>79</td>
<td>2529</td>
<td>78</td>
<td>3.1</td>
</tr>
<tr>
<td>1</td>
<td>80</td>
<td>4751</td>
<td>192</td>
<td>4.0</td>
</tr>
<tr>
<td>2 and 3</td>
<td>77</td>
<td>707</td>
<td>45</td>
<td>6.4</td>
</tr>
<tr>
<td>unknown</td>
<td>74</td>
<td>1989</td>
<td>75</td>
<td>3.8</td>
</tr>
<tr>
<td>All</td>
<td>82</td>
<td>9976</td>
<td>390</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Table 4. Cumulative incidence (pooled mean) of SSI in knee prosthesis by risk index

<table>
<thead>
<tr>
<th>Risk index category</th>
<th>Number of Trusts</th>
<th>Number of operations</th>
<th>Number of SSI</th>
<th>Pooled mean rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>118</td>
<td>17291</td>
<td>73</td>
<td>0.4</td>
</tr>
<tr>
<td>1</td>
<td>115</td>
<td>7617</td>
<td>84</td>
<td>1.1</td>
</tr>
<tr>
<td>2 and 3</td>
<td>102</td>
<td>884</td>
<td>14</td>
<td>1.6</td>
</tr>
<tr>
<td>unknown</td>
<td>112</td>
<td>6432</td>
<td>37</td>
<td>0.6</td>
</tr>
<tr>
<td>All</td>
<td>118</td>
<td>32224</td>
<td>208</td>
<td>0.6</td>
</tr>
</tbody>
</table>
6.3.1.2 Incidence of SSI by age group

The age group and median age of patients undergoing surgery is shown in Table 6. The median age for patients undergoing hip hemiarthroplasty is 14 years greater than those undergoing total hip prosthesis. The risk of SSI increases with patient age and the trend is statistically significant in total hip and knee prosthesis. However, some of the increased risk may be explained by patients in older age groups staying in hospital longer, thus increasing the possibility that SSI will be detected.

Table 6. Cumulative incidence of SSI by category of procedure and age group

<table>
<thead>
<tr>
<th>Risk index category</th>
<th>Number of Trusts</th>
<th>Number of operations</th>
<th>Number of SSI</th>
<th>Pooled mean rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>32</td>
<td>2182</td>
<td>19</td>
<td>0.9</td>
</tr>
<tr>
<td>1</td>
<td>33</td>
<td>1831</td>
<td>47</td>
<td>2.6</td>
</tr>
<tr>
<td>2 and 3</td>
<td>30</td>
<td>208</td>
<td>12</td>
<td>5.8</td>
</tr>
<tr>
<td>unknown</td>
<td>34</td>
<td>982</td>
<td>17</td>
<td>1.7</td>
</tr>
<tr>
<td>All</td>
<td>34</td>
<td>5203</td>
<td>95</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Table 5. Cumulative incidence (pooled mean) of SSI in open reduction of long bone fracture by risk index
6.4. Characteristics of the surgical site infections

6.4.1 Type of SSI

SSI are categorised into those that affect the superficial (skin and subcutaneous) tissues of the incision, and those that affect the deeper tissues (deep incisional) or joint itself. Most infections reported are superficial, but approximately one quarter affected the deeper tissues or joint (see Table 7).

Table 7. Type of surgical site infection by category of procedure

<table>
<thead>
<tr>
<th>Category of procedure</th>
<th>Type of SSI</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Superficial</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Deep or joint</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Total hip prosthesis</td>
<td>270</td>
<td>73.8</td>
<td>96</td>
</tr>
<tr>
<td>Hip hemiarthroplasty</td>
<td>273</td>
<td>69.8</td>
<td>118</td>
</tr>
<tr>
<td>Knee prosthesis</td>
<td>159</td>
<td>76.4</td>
<td>49</td>
</tr>
<tr>
<td>Open reduction long bone fracture</td>
<td>77</td>
<td>81.1</td>
<td>18</td>
</tr>
</tbody>
</table>

6.4.2 Micro-organisms causing SSI

Data on the micro-organisms causing SSI were available in 84% of infections. The main causative organisms are illustrated in Table 8.

*Staphylococcus aureus* is a common skin commensal and patients undergoing surgery are vulnerable to micro-organisms from their skin entering the surgical site. In this surveillance, 47% of the SSI where data on the causative organism were available were due to *S. aureus* and in 64% of these the *S. aureus* were resistant to methicillin (MRSA).

Figure 3. Micro-organisms reported as causing SSI for all categories of surgical procedures (CNS: coagulase-negative staphylococci)
6.5. Conclusions: Using the data to inform practice

A key aim of the surveillance is to encourage Trusts to use the data to evaluate local practice and institute changes where the results indicate this may be necessary. At the end of each surveillance period, participating Trusts receive an individual report that contains their results compared to the data aggregated from all participating hospitals. They use this data to monitor local practice and initiate further investigation and action should the results indicate that rates are unusual. Some additional analyses are undertaken by SSISS for those Trusts with a rate of SSI in the highest ten percent and these Trusts are contacted to ensure that they are aware of the potential problem.

In most Trusts the rates of SSI in orthopaedic surgery were found to be low and comparable with rates reported by other countries in Europe. However, since the surveillance detects only those SSI that develop during the post-operative hospital stay, they are an underestimate. In recent years the length of post-operative stay has reduced considerably in elective procedures such as knee and total hip replacements. Higher rates of SSI were reported following hip hemiarthroplasties, which are generally undertaken following a traumatic injury to the hip. This is partly explained by the patients undergoing these procedures being at greater risk of SSI due to their increased age and other underlying conditions. In addition, their post-operative stay in hospital is longer than those patients undergoing elective hip or knee replacement and therefore the chance that SSI will be detected by this surveillance is increased.

The ability of Trusts to compare their rates of SSI with others depends on the robust application of a standard method of identifying and reporting SSI and consequently the SSISS places a high priority on Trusts adhering to the standard SSI surveillance protocol. Many Trusts have reported a zero rate of SSI and this emphasises the importance of ensuring data collection methods are robust if reliable inter-hospital comparisons are to be made.

Most of the SSIs reported affected the superficial layers of the wound. These are likely to resolve with minimal long-term adverse effects on the patient. Approximately a quarter involved the deeper tissues and these infections are more difficult to treat and may require subsequent re-operation. *Staphylococcus aureus* are commonly found on the skin and hence surgical wounds are vulnerable to infection caused by these micro-organisms. *Staphylococcus aureus* was reported as the cause of half of the SSI and nearly two-thirds of the *Staphylococcus aureus* reported SSI were methicillin-resistant strains.
6.6. References


Acknowledgements

We are grateful to microbiology and infection control colleagues in NHS acute Trusts for their enduring contributions to surveillance, as well as efforts from colleagues in the regional offices of the Health Protection Agency.

Cover image provided courtesy of CDC/ Janice Carr.
### Glossary of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARL</td>
<td>Anaerobe Reference Laboratory</td>
</tr>
<tr>
<td>ASA</td>
<td>American Society of Anestheologists</td>
</tr>
<tr>
<td>CCU</td>
<td>Cardiac Care Unit or Coronary Care Unit</td>
</tr>
<tr>
<td>CDAD</td>
<td><em>Clostridium difficile</em> associated disease</td>
</tr>
<tr>
<td>CfI</td>
<td>Centre for Infections (at HPA)</td>
</tr>
<tr>
<td>DH</td>
<td>Department of Health</td>
</tr>
<tr>
<td>HDU</td>
<td>High Dependency Unit</td>
</tr>
<tr>
<td>HES</td>
<td>Hospital Episode Statistics</td>
</tr>
<tr>
<td>HPA</td>
<td>Health Protection Agency</td>
</tr>
<tr>
<td>ICU</td>
<td>Intensive Care Unit</td>
</tr>
<tr>
<td>MRSA</td>
<td>Methicillin Resistant <em>Staphylococcus aureus</em></td>
</tr>
<tr>
<td>SSI</td>
<td>Surgical Site Infection</td>
</tr>
<tr>
<td>SSISS</td>
<td>Surgical Site Infection Surveillance Service</td>
</tr>
</tbody>
</table>
Annex 1: Results of the fifth year of mandatory surveillance of MRSA bacteraemia, including data from the new enhanced surveillance scheme


1.1 Methods and Interpretation.

Methods

Summary point

The trust list contains the number of MRSA bacteraemia in each trust reported during the six month periods. The MRSA bacteraemia rate is calculated using this number divided by an estimate of the number of “patient-days” at risk, and expressed per 10,000 “patient-days”. The observed number of MRSA bacteraemia arise from those patients attending the Trust. However, in spite of having the total number of MRSA bacteraemia in each period, the MRSA bacteraemia rate will vary from one period to the next due to many reasons. For example, clinicians propensity to request blood cultures, those in the catchment population that attend the Trust during the period, errors in laboratory diagnosis, etc. When using the observed MRSA bacteraemia rate to make inferences about trust, some estimate of the uncertainty is required. The statistical accuracy of the estimate presented in the list is an attempt to quantify the uncertainty.

For trusts where the observed number of MRSA bacteraemia is greater than ten the MRSA bacteraemia rate ± statistical accuracy of the estimate will provide a 95% confidence interval. For trusts with ten or fewer MRSA bacteraemia the coverage probability of this interval will be less that 95%.

Interpretation of Trust Tables

- An MRSA bacteraemia report is made when MRSA is detected in a blood sample by culture.

- KHO3 bed days data are statistics based on an approximate count of the average number of occupied hospital beds in a trust each day (bed days). These data are collated by the Department of Health.

- The MRSA rates for each Trust represent the average number of MRSA bacteraemia reports per 10000 bed days, for that 6 month period.

- The first six surveillance periods from April 2001 to March 2004 have been reanalysed using the appropriate year’s bed occupancy data. These figures are now intended to represent a final dataset for that period.

- The last two surveillance periods in this series, from April 2004 to March 2005 and from April 2005 to March 2006, use the only available KHO3, namely that for the previous year 2004-05. These 2005-6 rates will be regarded as provisional and will be updated with the appropriate KHO3 data when available.

- In a short period of time such as six months, there may be few MRSA bacteraemia reports for a given Trust. In small trusts, changes of one or two bacteraemia reports can cause large fluctuations in MRSA rate, which can be misleading when making comparisons of values or ranks.
These data are not straightforward and need to be interpreted with care, taking the following into account:

- The individual Trust figures reflect the burden of serious infections associated with MRSA bacteraemia (or blood stream infections) and not all MRSA infection or carriage. An MRSA bacteraemia report is made when MRSA is detected in a blood sample.

- The MRSA bacteraemias reported by an acute Trust were not necessarily acquired in that Trust. There is much patient transfer between hospitals, such that a patient requiring specialist care may be transferred to a Trust with a specialist unit for their particular condition. When their care is complete, they may then return to the originating hospital. In this way Trusts may import MRSA from other hospitals or from the community.

- Not all acute Trusts are the same. Some have specialist units which receive referrals from other acute Trusts (e.g., renal or cancer units), while others include units which in other places form part of other types of Trusts, such as community or mental health Trusts. (Non-acute NHS Trusts are not included in the mandatory reporting scheme.) This means that it is not valid to compare one hospital Trust with another. The effect can be partly overcome by categorising Trusts as specialist, general acute, or single specialty, but this will not overcome all these difficulties. This requires more detailed local analyses incorporating information on risk factors and case mix.

- These differences in the make-up of different Trusts also have an effect on their MRSA rate. A Trust that has a high preponderance of units with more patients vulnerable to MRSA, such as specialist surgical units, is quite likely to experience a higher rate than a Trust that has a high proportion of lower risk units (e.g., maternity or paediatric wards) where patients are unlikely to experience MRSA bacteraemia. Thus, although a Trust may have a high rate, this does not necessarily reflect an infection control problem in the Trust. Rather, the rates, particularly if high, should form the basis of further investigation.

- The bed occupancy figures used to derive the MRSA bacteraemia rates in the period April to September 2005 are from a period before the MRSA data. This may affect a Trust's rate if there has been a significant change in activity that is not yet reflected in the bed occupancy figure. These rates will be updated when the bed occupancy figures for this period are available. The rates for the first four years (April 2001-March 2005) have been calculated using the bed occupancy figure for each year.

- All the bed occupancy figures used to calculate the rates apply only to overnight admissions. Consequently MRSA bacteraemias in patients who are not admitted overnight, e.g., in renal units, may make a Trust's rate look falsely high, as these patients will feature in the numerator but not in the denominator.

Finally, in a six month period, only a few bacteraemias may be reported. This means that in smaller Trusts, changes of one or two reports can cause large fluctuations in MRSA rate, which can be misleading when making comparisons of values or rates.

1.2 MRSA bacteraemia alphabetical Trust listing.

Please see attached Excel Spreadsheets
Annex 2: Mandatory Surveillance of *C. difficile* Associated Disease  2005


Please see attached Excel document.
Annex 3: The second year of mandatory Glycopeptide-Resistant Enterococci (GRE) surveillance


Please see attached Excel document.