MRSA at an English children’s hospital from 1998 to 2003

A Adedeji, J W Gray

Aims: To investigate the epidemiological and clinical aspects of MRSA among inpatients and outpatients presenting to hospital.

Methods: Analysis of demographic, epidemiological, and clinical data collected on 385 children first identified as having MRSA between January 1998 and December 2003 in a 250 bed English children’s hospital.

Results: There were 267 inpatients and 118 outpatients. The number of new cases of MRSA declined from 72 in 1998 to 52 in 2003, whereas hospital activity increased. Ninety nine (37.1%) inpatients acquired MRSA outside the hospital; a further 90 occurred among 31 clusters of cases. One hundred and seventy eight (66.7%) inpatients were aged <2 years; cardiac services and paediatric & neonatal surgery accounted for 59.6% of cases. Dermatology and A&E accounted for 51.7% of outpatients; 73.8% of outpatients had recently previously attended the hospital. A total of 13.9% of inpatients with MRSA developed bacteraemia; MRSA accounted for 15% of Staphylococcus aureus bacteraemias. The risk of MRSA bacteraemia in colonised patients, and the proportion of S aureus bacteraemias that were MRSA, varied between specialties. Intravascular devices were the most common source of MRSA bacteraemia (63.4% of cases). The mortality rate was 7.3%.

Conclusions: Enhanced surveillance of MRSA can identify at-risk patient groups, thus facilitating targeting of control measures. The absence of a link between numbers of cases of acquisition of MRSA and bacteraemia suggests that the rise in MRSA bacteraemia may not solely reflect an increase in MRSA prevalence in children in the UK. The need for larger epidemiological studies is emphasised.

RESULTS

During the study period 385 children were identified for the first time as being colonised or infected with MRSA, of whom 69.4% were inpatients. Boys accounted for 240 (62.3%) cases. The numbers of new cases of MRSA in both inpatients and outpatients were lower at the end than at the beginning of the study period (table 1). During the same period inpatient activity increased by 16.9% (from 21 775 to 25 454 consultant episodes); outpatient activity by 28.0% (from 82 976 to 106 221 attendances), and accident & emergency activity by 19.9% (from 37 005 to 44 368 attendances). A total of 178 (66.7%) inpatients were aged under 2 years compared with 36 (30.3%) outpatients (table 2). Cardiac services and paediatric & neonatal surgery accounted for 59.6% of inpatients with MRSA, whereas dermatology (39 cases) and A&E (22 cases) were the most common outpatient sources.

Abbreviations: MRSA, methicillin resistant Staphylococcus aureus; MSSA, methicillin sensitive Staphylococcus aureus; PICU, paediatric intensive care unit
specialties (table 3). A total of 23.6% of inpatients were receiving intensive care, whereas PICU accounted for only around 8% of hospital beds.

Ninety nine (37.1%) of the inpatients were judged to have acquired MRSA elsewhere than our hospital. A further 90 cases occurred among 31 clusters of two or more epidemiologically linked cases. Twenty eight of the clusters were associated with cardiac services, paediatric & neonatal surgery, or PICU, and in 17, one or more colonised staff members were identified, usually recent appointees. In response to this observation, routine screening of new staff members were identified, usually recent appointees. In response to this observation, routine screening of new staff

<table>
<thead>
<tr>
<th>Year</th>
<th>Inpatients</th>
<th>Outpatients</th>
<th>No. of episodes of MRSA bacteremia (%) with S aureus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>47</td>
<td>25</td>
<td>6.125</td>
</tr>
<tr>
<td>1999</td>
<td>44</td>
<td>25</td>
<td>3.68</td>
</tr>
<tr>
<td>2000</td>
<td>51</td>
<td>17</td>
<td>11.216</td>
</tr>
<tr>
<td>2001</td>
<td>50</td>
<td>16</td>
<td>11.262</td>
</tr>
<tr>
<td>2002</td>
<td>40</td>
<td>18</td>
<td>4.78</td>
</tr>
<tr>
<td>2003</td>
<td>35</td>
<td>17</td>
<td>6.158</td>
</tr>
<tr>
<td>Total</td>
<td>267 (69.4%)</td>
<td>118 (30.6%)</td>
<td>41 (15.0)</td>
</tr>
</tbody>
</table>

DISCUSSION

There are few data on the pattern of MRSA in children. S aureus accounted for only 6% of S aureus bacteraemias in New Zealand children between 1996 and 1998, but only 30% of bacteraemias in that study were hospital acquired, compared with 52.9% in our study. Khairulddin et al reported that the proportion of S aureus bacteraemias in children in England and Wales that were MRSA increased from 0.9% in 1990 to 13.1% in 2000. Overall, the fraction of S aureus bacteraemias that were MRSA in our hospital (15.0%) was comparable to that in the final years of the national survey. However, whereas Khairulddin and colleagues reported an almost unbroken upward trend in the proportion of MRSA bacteremias, we found that the proportion of MRSA bacteremias varied markedly from year to year, ranging between 6.8% and 26.2%, and bore no relation to numbers of patients acquiring MRSA in the same year.

The finding that MRSA accounted for an increasing proportion of S aureus bacteraemia has been used to suggest that MRSA is increasing in UK hospitals. However, during the six years studied, we found no increase in the numbers of children acquiring MRSA. This may reflect our management of MRSA, which mirrors the Dutch Search and Destroy strategy. In particular, our enhanced surveillance has allowed us to target high risk areas of the hospital leading to a decrease in MRSA acquisitions.
us to introduce screening of new staff in these areas. Early indications are that this strategy has been successful: in 2003, the first year in which staff in all three highest risk areas were screened, there were only two clusters of acquisition of MRSA.

Our experience of a relatively high proportion of MRSA bacteraemias, together with year-on-year variation, against a background of unchanged or decreasing numbers of children acquiring MRSA suggests that increasing complexity of medical care may have been an important contributory factor to the surge in MRSA bacteraemias seen during the 1990s. The observations that more than half of MRSA bacteraemias were intravascular device related, and that 30% of them occurred in the PICU further support this hypothesis. It is well recognised that colonisation with MRSA can be persistent. In our series, although the median time between first isolation of MRSA from any site and onset of bacteraemia was only 8 days, 18.9% and 13.5% of patients had been colonised for more than one and six months respectively at the time of onset of bacteraemia. This indicates that treatment to attempt eradication of MRSA colonisation is worthwhile in any children undergoing continuing hospital care in order to reduce the risk of subsequent MRSA bacteraemia.

It is notable that there was no increase in the numbers of outpatients with MRSA during the period of surveillance, and that few of these children had no history of recent hospital attendance. Previous hospitalisation has previously been identified as a risk factor for acquiring MRSA in the community. Thus while reports from the USA in particular suggest that MRSA is circulating widely among children outside hospital, our small study, dealing only with children presenting to hospital services, suggests that this may not be the case in the UK.

There are conflicting reports on whether the mortality rate due to bacteraemia with MRSA is higher than that from bacteraemia with MSSA, because of the effect of confounding host variables. However, many studies have found the mortality rate due to MRSA bacteraemia to be higher. However, mortality due to S aureus bacteraemia in children is uncommon, and small numbers in studies such as this do not allow an assessment of the relative risks.

In conclusion, ongoing surveillance of MRSA in our hospital has identified patient groups at greatest risk of acquiring MRSA, thus facilitating targeting of control measures. Early evidence suggests that our strategy of screening high risk staff and patients has been successful in reducing both the absolute number of cases of MRSA acquired in our hospital, and the number of clusters of epidemiologically linked cases. We found no link between numbers of cases of acquisition of MRSA and MRSA bacteraemia, suggesting that the nationally reported rise in MRSA bacteraemia in children cannot be assumed to reflect a large increase in the prevalence of MRSA among children either in hospitals or in the community. Other factors, such as the increasing complexity of medical care, may be important contributors to the rise in MRSA bacteraemia. We reiterate the need for larger studies to investigate the epidemiology of MRSA in children in order to determine the future direction of control measures.

### Table 3 Acquisition of MRSA in inpatients and outpatients, and MRSA bacteraemia, according to specialty

<table>
<thead>
<tr>
<th>Specialty</th>
<th>No. of cases of MRSA in:</th>
<th>No. of inpatients with MRSA who developed bacteraemia</th>
<th>No. of episodes of MRSA bacteraemia (% all episodes of bacteraemia with S aureus)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inpatients</td>
<td>Outpatients</td>
<td></td>
</tr>
<tr>
<td>A&amp;E</td>
<td>0</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>Cardiac services</td>
<td>90</td>
<td>1</td>
<td>8 (8.9)</td>
</tr>
<tr>
<td>Dermatology</td>
<td>0</td>
<td>39</td>
<td>0</td>
</tr>
<tr>
<td>Gastroenterology &amp; hepatology</td>
<td>15</td>
<td>3</td>
<td>7 (46.7)</td>
</tr>
<tr>
<td>General paediatrics</td>
<td>31</td>
<td>4</td>
<td>4 (12.9)</td>
</tr>
<tr>
<td>Haematology &amp; oncology</td>
<td>8</td>
<td>4</td>
<td>5 (62.5)</td>
</tr>
<tr>
<td>Neurosciences</td>
<td>15</td>
<td>1</td>
<td>1 (6.7)</td>
</tr>
<tr>
<td>Orthopaedic surgery</td>
<td>7</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Paediatric &amp; neonatal Surgery</td>
<td>69</td>
<td>7</td>
<td>11 (16.7)</td>
</tr>
<tr>
<td>Plastic surgery &amp; burns</td>
<td>10</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Respiratory medicine (including cystic fibrosis)</td>
<td>9</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>Other medical specialties</td>
<td>6</td>
<td>2</td>
<td>1 (16.7)</td>
</tr>
<tr>
<td>Other surgical specialties</td>
<td>7</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>267</td>
<td>118</td>
<td>37 (13.9)</td>
</tr>
</tbody>
</table>

### What is already known on this topic
- MRSA may be an increasing problem among children in England and Wales
- Reports have highlighted the lack of epidemiological and clinical data on MRSA circulating among children in the community outside hospitals

### What this study adds
- We found no evidence that MRSA is becoming more common in our hospital
- Few cases were seen without a history of recent hospital attendance, suggesting that MRSA is not endemic in the community
- Hospital acquisition of MRSA is most common in certain specialties which should facilitate targeting of control measures
MRSA at an English children’s hospital

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REFERENCES

www.archdischild.com
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