SA Healthcare-Associated Infection Surveillance Program
Multidrug-resistant Organisms 2016 Annual Report (revised edition)

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This annual report can be accessed
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Disclaimer

The data presented in this report were correct at the time of publication and reflect rates based on the numerator and denominator data supplied. Minor discrepancies with previous reports may occur as data adjustments are made retrospectively.
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Introduction

The Infection Control Service of South Australian Department for Health and Aging coordinates the collection of surveillance data for healthcare-associated bloodstream infection, selected surgical site infections, methicillin-resistant *Staphylococcus aureus*, multidrug-resistant Gram-negative organisms, *Clostridium difficile* infection and antibiotic utilisation.

This report focuses on the analysis of healthcare-associated infection and colonisation with multidrug-resistant organisms (MRO) acquired by patients in participating South Australian hospitals. It does not include information on the percentage resistance of the various target organisms, but rather focuses on the overall clinical impact of antibiotic resistance in health care.

Antibiotic-resistant organisms deemed to be of epidemiological importance and therefore included in the South Australian surveillance program include:

- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- Vancomycin-intermediate/resistant *Staphylococcus aureus* (VISA/VRSA)
- Vancomycin-resistant enterococci (VRE)
- extended-spectrum beta-lactamase producing Gram-negative organisms (ESBL)*
- multidrug-resistant *Pseudomonas aeruginosa* (MR PAER)*
- carbapenem-resistant *Acinetobacter* species and Enterobacteriaceae (CR GNB)*
- plasmid-mediated AmpC beta-lactamase producers (AMP C)*
- metallo beta-lactamase producers (MBL)*.

* collectively referred to as multidrug-resistant Gram-negatives (MRGN) in this report

The South Australian healthcare-associated surveillance report data is received from eight public and nine private metropolitan hospitals, and six Country Health SA (CHSA) hospitals. Of the 23 contributors, 11 provide data stratified by intensive care unit status (paediatric, neonatal or adult ICU).

The Infection Control Service regularly reports aggregated and individual hospital level data to contributors and other relevant stakeholders with the intention of providing information that assists in the process of risk reduction and supports continuous quality improvement activities.

For benchmarking purposes hospitals are grouped according to their size and acuity based on the current Australian Institute of Health and Welfare peer groupings and there have been some changes since the previous report. Modbury hospital and the Repatriation General hospital are now classified as type 1; private hospitals are now grouped separately from the type 2 public hospitals.

This report presents an analysis of cumulative data collected on the incidence of and morbidity due to the above targeted organisms for the period January 2010 to December 2016 and updates the previous report published in 2016.

There have been some minor amendments to the report since first publication; these are highlighted in yellow in this edition.
Summary of Findings

> The aggregate rate of MRSA acquisition for all contributing hospitals has decreased to 1.7 per 10,000 bed-days in 2016 from 2.2 in 2015. Of the 166 healthcare-associated MRSA infections reported in 2016, 34% occurred in patients known to be colonised with this organism.

> The aggregate rate of infection with VRE has remained unchanged in 2016 at 0.6 per 10,000 bed-days; the most common site of VRE infection in 2016 was urine (41%).

> The aggregate rate of infection caused by ESBL-producing Enterobacteriaceae increased from 0.84 per 10,000 bed days in 2015 to 0.97 in 2016; the most common site of ESBL infection in 2016 was urine (59%).

> For type 1 hospitals, the infection rates for the main groups of multidrug-resistant organisms remained relatively unchanged during 2016 compared to 2015:
  - MRSA remains unchanged from the previous year at 1.5 per 10,000 bed-days
  - MRGN increased to 1.8 per 10,000 bed-days in 2016 from 1.7 in 2015
  - VRE decreased to 0.8 per 10,000 bed-days in 2016 from 0.9 in 2015.

> For all contributors in 2016, the primary site of first acquisition for MRSA (excluding screening specimens) was skin or wound (65%), for VRE it was urine (61%) followed by skin or wound (18%), and for MRGN it was urine (59%).

> For intensive care patients, there was a non-significant increase in sterile site MRSA infections from 0.4 per 10,000 bed-days in 2015 to 1.1 in 2016; the rate of MRSA infection in non-sterile body sites also increased from 2.7 per 10,000 bed-days in 2015 to 2.9 in 2016. The predominant site of MRSA infection in ICU patients was the respiratory tract (62%), followed by bloodstream (29%) and skin/wound (10%).

> The MRGN acquisition rate continues to increase, from 1.1 per 10,000 bed-days in 2010 to 1.7 per 10,000 bed-days in 2016, the majority of new acquisitions were detected in clinical specimens and identified as causing clinical infection.
Methods

Data are contributed by the Infection Control Units of participating hospitals according to the agreed statewide surveillance definitions. Current definitions are available from the Infection Control Service website: www.sahealth.sa.gov.au/infectionprevention. The definitions and methodology used are based on the national definitions for multidrug-resistant organisms originally developed by the Australian Infection Control Association (AICA) National Advisory Board\(^1\).

Contributors are asked to notify the Infection Control Service of any changes to surveillance practices (e.g. frequency of microbiological screening) or infection control practices (e.g. the introduction of novel technologies) that might impact on the MRO surveillance data contributed by individual hospitals.

Numerator

The numerator includes all new healthcare-associated acquisitions and infections identified during the period of surveillance. Episodes are designated as either intensive care unit (ICU) or non-ICU related and defined as representing infection or colonisation. Intensive care unit surveillance includes data from neonatal (NICU) and paediatric (PICU) units.

MRGN data analysis summarises MRO episodes recorded by resistance type (i.e. patients may be counted more than once in aggregate MRGN counts and rates if they have an infection with more than one MRO type).

Denominator

The denominator used for rate calculations in this report is called “bed-days”, and includes same day admissions and unqualified new-borns\(^\#\). Bed-days are a combination of patient days and occupied bed days depending on the collection source. There is minimal variance between yearly patient-day and occupied bed-day calculations (less than 1%)\(^2\).

\[
\text{Total bed-days} = \text{Total patient days} \\
\text{ICU bed-days} = \text{AICU patient days} + \text{PICU occupied bed-days} + \text{NICU occupied bed-days} \\
\text{Non-ICU bed-days} = \text{Total bed-days} - \text{ICU bed-days}. \]

Statistical methods

The relative risks for incidence rate comparisons were calculated using the “ir” command in Stata version 13.

Surveillance definitions

Surveillance definitions can be found at the following web page:

Hospital type

The contributing institutions were divided into three categories based on a combination of the size and characteristics described by the Australian Institute of Health and Welfare (AIHW) Peer Groups\(^3\).

Type 1 incorporates large public acute and principal referral hospitals as well as specialist women’s and children’s hospitals; while type 2 incorporates medium public acute and small public acute facilities with surgical/obstetric services. As there is currently no AIHW classification for private contributors, they have been grouped together and make up the PRIV category.

Unqualified newborns figures have been retrospectively added to the denominators for the report period. An unqualified newborn is 9 days old or less and meets one of the following criteria\(^4\):

- is a single live birth or the first live born infant in a multiple birth, whose mother is currently an admitted patient
- is not admitted to an intensive care facility in a hospital, being approved by the Commonwealth Minister for the purpose of the provision of special care.
## Participating hospitals

<table>
<thead>
<tr>
<th>Public Hospitals</th>
<th>Type</th>
<th>Private Hospitals</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flinders Medical Centre</td>
<td>1</td>
<td>Ashford Hospital</td>
<td>PRIV</td>
</tr>
<tr>
<td>Lyell McEwin Hospital</td>
<td>1</td>
<td>Burnside Hospital</td>
<td>PRIV</td>
</tr>
<tr>
<td>Modbury Hospital</td>
<td>1</td>
<td>Calvary Hospital</td>
<td>PRIV</td>
</tr>
<tr>
<td>Queen Elizabeth Hospital</td>
<td>1</td>
<td>Flinders Private Hospital</td>
<td>PRIV</td>
</tr>
<tr>
<td>Repatriation General Hospital</td>
<td>1</td>
<td>Memorial Hospital</td>
<td>PRIV</td>
</tr>
<tr>
<td>Royal Adelaide Hospital</td>
<td>1</td>
<td>North Eastern Hospital</td>
<td>PRIV</td>
</tr>
<tr>
<td>Women's &amp; Children's Hospital</td>
<td>1</td>
<td>St. Andrew’s Hospital</td>
<td>PRIV</td>
</tr>
<tr>
<td>Noarlunga Hospital</td>
<td>2</td>
<td>Wakefield Hospital</td>
<td>PRIV</td>
</tr>
<tr>
<td>Port Augusta Hospital</td>
<td>2</td>
<td>Western Hospital</td>
<td>PRIV</td>
</tr>
<tr>
<td>Port Lincoln Hospital</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port Pirie Hospital</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whyalla Hospital</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riverland (Berri) Regional Services</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mount Gambier Hospital</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results

1. Overall trends in healthcare infection caused by MRO

The most robust indicator of MRO control in hospitals is the infection rate, since this is unlikely to be influenced by changes in hospital screening practices. Charts 1 and 2 show the overall trend in healthcare associated infection rates for methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE) and multidrug-resistant Gram-negative organisms (MRGN) for SA public hospitals classified as type 1 and type 2, and private hospitals.

*Chart 1: Healthcare-associated infection rates for MRSA, VRE and MRGN in type 1 hospitals*

Chart 1 shows that for type 1 hospitals, the overall MRSA infection rate remained relatively stable between 1.4 and 1.6 per 10,000 bed-days since 2012. Over the same time period there was an increase in the rates of infection with MRGN from 1.3 per 10,000 bed-days in 2012 to 1.8 per 10,000 bed-days in 2016 (P<0.05) and VRE from 0.4 per 10,000 bed-days in 2012 to 0.8 per 10,000 bed-days in 2016 (P<0.05).

*Chart 2: Healthcare-associated infection rates for MRSA, VRE & MRGN in type 2 and private hospitals*
Chart 2 shows the overall MRO infection rates for type 2 and private hospitals. The rates are generally lower than for type 1 hospitals, which is consistent with the usually higher risk patient population and more complex procedures encountered in type 1 facilities. There is a trend towards increased rates of MRGN infection in the private hospitals.

Interestingly, higher MRGN infection rates are observed in private hospitals compared to type 2 public facilities. This may also be due to differences in patient risk factors, or may reflect the degree of patient movement between the public and private sector, but there are no data to determine this.

No conclusions on trends in these smaller facilities can be made due to the low numbers of cases and consequent high degree of variability (as illustrated by the wide confidence intervals around the data points).

**Primary site of acquisition**

Routine screening continues to account for a large percentage of total new acquisitions for MRSA (36%) and VRE (80%); however for MRGN almost all new acquisitions were detected in clinical specimens as there is no routine screening performed for MRGN carriage, due to difficulties in laboratory detection from screening specimens (except for Carbapenemase producing Enterobacteriaceae, CPE).

Chart 3 shows the distribution of new MRO acquisitions by specimen site for 2016, excluding routine screening specimens. The primary site of acquisition recorded for MRSA was skin/wound (65%), for MRGN the primary site was urine (59%) and for VRE 61% were from urine and 18% from skin/wound.

*Chart 3: The primary site of acquisition of MRO (excluding screening) for 2016*

* Tissue or body fluid other than blood.
2. Methicillin-resistant *Staphylococcus aureus* (MRSA)

Healthcare associated infections caused by MRSA can be difficult to treat and are associated with poor outcomes for hospitalised patients.

Data on MRSA are collected for three key indicator rates, i.e., burden, acquisition and morbidity (infection), and are reported on a monthly basis by all contributing hospitals. The infection rate includes all patients who develop healthcare-associated infection, both newly identified and in known MRSA carriers. The acquisition rate includes all cases of newly identified MRSA colonisation and infection. The burden is a measure of the total number of known MRSA positive patients (infected and colonised) who have been present in hospital during the month of surveillance.

Chart 4 summarises trends for all three indicators.

*Chart 4: MRSA infection and acquisition rates compared to the overall burden of MRSA, 2010-2016.*

The most robust measure of MRSA control is the infection rate, since this is less affected by variation in screening practices over time; this rate has decreased from 1.4 per 10,000 bed-days in 2010 to 1.0 per 10,000 bed-days in 2016. A total of 166 MRSA infections were reported in 2016, down from 189 in 2015.

The aggregate rate of MRSA acquisition declined significantly over the seven years from 3.8 per 10,000 bed-days in 2010 to 1.7 in 2016 (p<0.0001). Although this rate can be affected by changes in screening practices, there is no anecdotal evidence that hospital screening policies for MRSA have changed substantially over this period of surveillance.

Previous colonisation with MRSA has been shown to be associated with an increased risk of MRSA infection. Of the 166 healthcare-associated MRSA infections reported in 2016, 56 (34%) occurred in patients known to be colonised with this organism.

*NOTE: 2014/2015 burden data for 3 private contributors includes estimates due to issues caused by the implementation of a new IT system*
Intensive Care Unit associated MRSA

The rate of MRSA infection in ICU patients is generally higher than for non-ICU patients, reflecting the increased risk of acquiring infection in intensive care due to the highly invasive nature of medical intervention in these patients; however, the total number of infections in ICU patients is relatively small.

Table 1 shows numbers of MRSA infections in 2016 stratified by ICU status and specimen site (sterile vs non-sterile body sites). Sterile site infections include blood, normally sterile tissues and aseptically collected fluids such as joint, pleural and peritoneal fluids. The dataset includes non-ICU associated cases from all contributors and ICU associated cases from contributors with adult, paediatric and neonatal intensive care units.

Table 1: MRSA infections by patient location and specimen classification – 2016

<table>
<thead>
<tr>
<th>Patient Location: Specimen Site</th>
<th>Number of MRSA HAI</th>
<th>Number of bed-days</th>
<th>MRSA HAI rate per 10,000 bed-days [CI95]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU : Sterile Site</td>
<td>6</td>
<td>52330</td>
<td>1.15 [ 0.42 - 2.50 ]</td>
</tr>
<tr>
<td>ICU : Non-sterile Site</td>
<td>15</td>
<td>52330</td>
<td>2.87 [ 1.60 - 4.73 ]</td>
</tr>
<tr>
<td>Total ICU</td>
<td>21</td>
<td>52330</td>
<td>4.01 [ 2.48 - 6.14 ]</td>
</tr>
<tr>
<td>Non-ICU : Sterile Site</td>
<td>33</td>
<td>1539395</td>
<td>0.21 [ 0.15 - 0.30 ]</td>
</tr>
<tr>
<td>Non-ICU : Non-sterile Site</td>
<td>112</td>
<td>1539395</td>
<td>0.73 [ 0.60 - 0.88 ]</td>
</tr>
<tr>
<td>Total Non-ICU</td>
<td>145</td>
<td>1539395</td>
<td>0.94 [ 0.79 - 1.11 ]</td>
</tr>
</tbody>
</table>

NOTE: ICU data include records from all intensive care units, including adult, paediatric and neonatal.

Chart 5 shows the trend in MRSA infections by infection type and patient location (ICU or non-ICU) over the past 5 years. The most noticeable change since 2015 was an increase in the ICU rate of MRSA infection in sterile sites from 0.39 per 10,000 bed-days in 2015 to 1.15 per 10,000 bed-days in 2016; although this was not statistically significant.

Chart 5: MRSA infections by patient location and specimen classification, 2012-2016

NOTE: Data include records from all intensive care units, including adult, paediatric and neonatal.
Primary site of infection

The data presented in chart 6 below show marked differences in the primary site of infection with MRSA according to patient location. The data are combined for the 2010-2016 reporting period due to the small number of annual infections in ICU patients.

The predominant site of MRSA infection in ICU patients was the respiratory tract (56%) compared to non-ICU patients where the predominant site of infection was skin or wound (68%). It is interesting to note that amongst non-ICU patients a sizable proportion of MRSA infections occur in the bloodstream and other sterile body sites (19% in total).

* Chart 6: The primary site of MRSA infections for years 2010-2016 combined

* Tissue or body fluid other than blood
3. Multidrug-resistant organisms (other than MRSA)

Chart 7 shows the trend in annual infection rates for multidrug-resistant organisms other than MRSA, some of which have been rising steadily since 2010. The main increase in infection rates for this group of MROs, is seen in extended beta-lactamase producers (ESBL).

*Chart 7: The rate of MRO infections for all contributors by resistance category (excluding MRSA).*

**Other** includes carbapenem-resistant Enterobacteriaceae & Acinetobacter sp and metallo-beta-lactamase producers.

Vancomycin-resistant Enterococci (VRE)

The number of VRE infections decreased from 100 episodes in 2015 to 92 episodes in 2016, representing an infection rate of 0.62 in 2015 compared to 0.58 per 10,000 bed days for 2016.

Of the 92 VRE infections reported in 2016, 30% were in patients known to be colonised with VRE. The predominant site of VRE infection in 2016 was urine (41%) followed by blood (23%) and skin/wound (22%).

Multidrug-resistant Gram-negative bacteria (MRGN)

The MRGN group includes surveillance on the following resistance types: multidrug-resistant *Pseudomonas aeruginosa* (MR PAER), extended beta-lactamase producers (ESBL), carbapenem-resistant *Acinetobacter* species and Enterobacteriaceae (CR GNB), plasmid-mediated Amp C beta-lactamase producers (AMP C) and metallo-beta-lactamase producers (MBL). For the purposes of this report, MR PAER and ESBL have been reported separately, with the remaining multidrug-resistant Gram-negatives grouped into the “other” category.

The overall number of MRGN infections has continued to increase over the reporting period. This increase in MRGN infections has occurred mainly in type 1 and private hospitals. In comparison, type 2 hospitals have experienced a slightly lower rate of infection during this period (Refer charts 1 and 2).

Infections caused by ESBL-producing Enterobacteriaceae increased from 0.52 per 10,000 bed-days in 2010 to 0.97 per 10,000 bed-days in 2016 (P<0.0001). The main species found to be harbouring ESBL resistance determinants were *Escherichia coli* (65%) followed by *Klebsiella* species (15%) and *Enterobacter* species (14%).
There were eleven infections caused by carbapenem-resistant Gram-negative bacteria during the period 2010-2016. Four of these were due to a transferable plasmid-mediated carbapenemase; one OXA-23 in an *Acinetobacter baumannii* and three MBL (1 x *Klebsiella pneumoniae*, 2 x *Pseudomonas aeruginosa*). (see raw data in Tables 2a and 2b on the next page).

**Sources of MRO infections**

For 2010-2016 data combined, the most common site of infection for ESBL-producing Gram-negative bacteria was urine (59%) and for multidrug-resistant *Pseudomonas aeruginosa* the majority of infections were either in urine (32%) or the respiratory tract (34%). The primary site of VRE infections was urine (33%), followed by blood (29%) and skin/wound (24%).

**Intensive Care Unit associated MRO (other than MRSA)**

The following dataset includes non-ICU associated cases from all contributors and ICU associated cases from adult, paediatric and neonatal intensive care units.

Intensive care patients have the highest risk for acquisition of multidrug-resistant organisms mainly because of their increased exposure to antibiotics as well as a high level of invasive medical intervention. This is illustrated by much higher rates of MRGN acquisition and infection seen in ICU patients compared to that for patients in the general wards (see Chart 8). The overall rate of MRGN acquisition in ICU increased from 6.1 per 10,000 bed-days in 2010 to 9.4 per 10,000 bed-days in 2016 but this was not statistically significant (p=0.034).

Chart 8: New MRGN acquisition rate, by ICU/non-ICU and infection status
Tables 2a and 2b show the number of MRO infections (excluding MRSA) per year stratified by resistance category and patient location.

In 2016, ICU associated MRO infections (excluding MRSA) represent about 17% of the total number of MRO infections (excluding MRSA) overall, and 18% of the total number of ESBL infections.

**Table 2a: MRO (excluding MRSA) infections* by resistance category - ICU**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP C</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>CR GNB</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>ESBL</td>
<td>8</td>
<td>11</td>
<td>9</td>
<td>20</td>
<td>14</td>
<td>15</td>
<td>28</td>
</tr>
<tr>
<td>MBL</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MR PAER</td>
<td>9</td>
<td>9</td>
<td>12</td>
<td>12</td>
<td>7</td>
<td>11</td>
<td>10*</td>
</tr>
<tr>
<td>VRE</td>
<td>16</td>
<td>10</td>
<td>11</td>
<td>16</td>
<td>9</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>30</td>
<td>34</td>
<td>51</td>
<td>35</td>
<td>41</td>
<td>56</td>
</tr>
</tbody>
</table>

* Note: these datasets also include infections from previously colonised patients.

**Table 2b: MRO (excluding MRSA) infections* by resistance category – non-ICU**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP C</td>
<td>4</td>
<td>15</td>
<td>24</td>
<td>15</td>
<td>40</td>
<td>37</td>
<td>35</td>
</tr>
<tr>
<td>CR GNB</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1*</td>
</tr>
<tr>
<td>ESBL</td>
<td>75</td>
<td>84</td>
<td>100</td>
<td>134</td>
<td>129</td>
<td>121</td>
<td>126</td>
</tr>
<tr>
<td>MBL</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MR PAER</td>
<td>37</td>
<td>46</td>
<td>25</td>
<td>24</td>
<td>24</td>
<td>32*</td>
<td>30</td>
</tr>
<tr>
<td>VRE</td>
<td>58</td>
<td>55</td>
<td>43</td>
<td>55</td>
<td>68</td>
<td>90</td>
<td>80</td>
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<tr>
<td>Total</td>
<td>175</td>
<td>202</td>
<td>192</td>
<td>229</td>
<td>261</td>
<td>280</td>
<td>272</td>
</tr>
</tbody>
</table>

* Note: these datasets also include infections from previously colonised patients.

# includes cases of transferable plasmid-mediated carbapenemase

In 2016, there was one carbapenemase-producing Enterobacteriaceae (Klebsiella pneumoniae MBL), as well as one carbapenemase-producing Pseudomonas aeruginosa (MBL).
Benchmarking

For multidrug-resistant organisms, the only readily available benchmarking data in Australia are for MRSA infection and colonisation in ICU patients collected by the Healthcare Infection Surveillance program in Western Australia (HISWA)\(^5\).

The comparison data are presented in table 3 below. Although there is a slight difference in the definition of the denominator used by SA to that used by HISWA, the yearly variance between them is minimal (less than 1\%)\(^2\) and is unlikely to significantly affect the overall rates.

<table>
<thead>
<tr>
<th>MRSA clinical indicator descriptions and comparative data</th>
<th>Infection rate per 10,000 denominator*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>South Australia 2015/16*</td>
</tr>
<tr>
<td>5.1 AICU-associated new MRSA infections in a <strong>sterile site</strong></td>
<td>0.96</td>
</tr>
<tr>
<td>5.2 AICU-associated new MRSA infections in a <strong>non-sterile</strong> site</td>
<td>1.67</td>
</tr>
<tr>
<td>5.3 Non ICU-associated new MRSA infections in a <strong>sterile site</strong></td>
<td>0.17</td>
</tr>
<tr>
<td>5.4 Non ICU-associated new MRSA infections in a <strong>non-sterile</strong> site</td>
<td>0.79</td>
</tr>
</tbody>
</table>

*SA data are calculated using bed-days, whereas HISWA are calculated using occupied bed days. Data excludes data from paediatric and neonatal intensive care units. WA data excludes data from inpatient psychiatric wards.

The above South Australian MRSA infection rates for three of the four indicators (ICU-associated non-sterile site infections, non ICU-associated sterile site infections and non ICU-associated non-sterile site infections) are lower than those reported for 2015. However, there has been a slight increase in the rate of sterile site infections in ICU patients, from 0.50 per 10,000 bed-days in 2015 to 0.96 in 2016.
Discussion

The prevalence of antibiotic resistance in bacteria is driven primarily by antibiotic use (appropriate or inappropriate) and lapses in infection control practices, which can lead to transfer of resistant organisms between patients in health care settings. Infections with antibiotic resistant organisms are associated with poorer outcomes for patients, therefore it is important to minimise both the emergence of new antibiotic resistances and the spread of existing resistant organisms.

The main changes seen in this report compared to the previous year have been: continued increase in the number of infections caused by MRGN, predominantly ESBL-producers, and a stabilisation of the rate of infection caused by VRE. For MRSA, there was a continued decrease in the acquisition rate and a slight decrease in the infection rate during 2016 compared to previous years.

The previously noted increase in incidence of infections with ESBL-producing Enterobacteriaceae over the past five years continues to be of concern. This trend has been noted worldwide\(^6\) and probably reflects the increased incidence of community-associated acquisition from exposure during travel to countries with high endemic rates of colonisation with these organisms,\(^7\) although the influence of local antibiotic usage patterns cannot be ruled out.

SA hospitals have not routinely screened patients on admission for carriage of MRGN, but with the potential for emergence of carbapenemase-producing Enterobacteriaceae (CPE) this has been reviewed. The Australian Commission for Safety and Quality in Health Care recently issued guidance for the control of CPE\(^8\) which recommends routine screening for CPE in patients who have received treatment in an overseas hospital. A recent cluster of carbapenemase-producing *Klebsiella pneumoniae* detections in Victoria, involving two hospitals and a number of aged care facilities, highlights the need to be vigilant for the introduction of these critical resistances into SA facilities.\(^9\)

There was one case of CPE in 2016 (*Klebsiella pneumoniae* MBL).


Work continues through the SA Health Advisory Group on Antimicrobial Resistance to improve antibiotic stewardship throughout SA Health hospitals. Statewide antibiotic prescribing guidelines have been developed for a number of indications, and work continues on the implementation of the national clinical care standards for antimicrobial stewardship. This work should help to limit the antibiotic pressure that is responsible for the promotion of antimicrobial resistance.

The epidemiology and dynamics of spread of these organisms is complex. Continued surveillance of infections, particularly in high risk patient populations such as those in intensive care, is required to alert clinicians to the emergence of new resistances and to monitor the effectiveness of antibiotic stewardship and infection control measures.
References


For more information

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