South Australian Healthcare-associated Infection Surveillance Program

Multidrug-resistant Organisms

Annual Report 2020

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SA Healthcare-Associated Infection Surveillance Program
Multidrug-resistant Organisms 2020 Annual Report

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This annual report can be accessed
at the Department for Health and Wellbeing
Internet site www.sahealth.sa.gov.au/HAIstatistics

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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, Communicable Disease Control Branch, of South Australian (SA) Department for Health and Wellbeing coordinates the collection of surveillance data for healthcare-associated bloodstream infection, targeted surgical site infections, methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant enterococci (VRE), multidrug-resistant Gram-negative organisms and *Clostridioides difficile* infection, and regularly reports the aggregated and individual hospital data to the contributors.

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

Antibiotic-resistant organisms deemed to be of epidemiological importance and therefore included in the SA 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* (MRPAER)*
- carbapenem-resistant *Acinetobacter* species and *Enterobacterales* (CRGNB)*
- plasmid-mediated AmpC beta-lactamase producers (AMPC)*
- metallo beta-lactamase producers (MBL)*.

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

The data for the SA healthcare-associated surveillance report is received from eight public and nine private metropolitan hospitals, and six major regional SA hospitals. Of the 23 contributors, 11 provide data stratified by intensive care unit (ICU) 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 public hospitals are classified according to their size and acuity into type 1 and type 2 groups based on the current Australian Institute of Health and Welfare (AIHW) peer groupings. Private hospitals are grouped separately. Please refer to the Methods section for definitions.

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 2012 to December 2020 and updates the previous report published in 2020.

Summary of Key Findings

- For type 1 hospitals:
  - MRSA infection rate decreased from 1.1 per 10,000 bed-days in 2019 to 0.9 per 10,000 bed-days in 2020.
  - MRGN infection rate remained steady at 2.0 per 10,000 bed-days in 2020.
  - VRE infection rate decreased from 0.4 per 10,000 bed-days in 2019 to 0.2 per 10,000 bed-days in 2020.
- For all contributors in 2020, the primary body site of acquisition (excluding screening specimens) for MRSA was skin or wound (74%), for VRE and MRGN; it was urinary tract at 46% and 68% respectively.
- The aggregate rate of MRSA infection for all contributing hospitals decreased slightly from 0.9 per 10,000 bed-days in 2019 to 0.8 per 10,000 bed-days in 2020. Of the 125 healthcare-associated MRSA infections reported in 2020, 22% occurred in patients known to be colonised with this organism.
- For intensive care unit patients, there was an increase in sterile site MRSA infections from 0.2 per 10,000 bed-days in 2019 to 1.2 per 10,000 bed-days in 2020, the rate of MRSA infection in non-sterile body sites also increased from 1.3 per 10,000 bed-days in 2019 to 1.4 per 10,000 bed-days in 2020.
- The aggregate rate of infection with VRE decreased from 0.3 per 10,000 bed-days in 2019 to 0.2 per 10,000 bed-days in 2020.
- The aggregate rate of infection caused by ESBL-producing *Enterobacterales* increased from 1.0 per 10,000 bed days in 2019 to 1.1 per 10,000 bed-days in 2020.
  - ESBL continues to be the main MRGN reported, the rate of acquisition increased from 1.2 per 10,000 bed-days in 2019 to 1.3 per 10,000 bed-days in 2020.

There was a significant ($p<0.001$) decrease in the healthcare associated carbapenemase-producing Enterobacterales acquisition rate in 2020, from 0.12 per 10,000 bed-days in 2019 to 0.04 per 10,000 bed-days in 2020.

Methods

Data are contributed by the Infection Prevention and Control Units of participating hospitals according to the agreed statewide surveillance definitions. Current definitions are available from the SA Health 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 adult (AICU), 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 newborns[#]. 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].

- Total bed-days = Total patient days
- ICU bed-days = AICU patient days + PICU occupied bed-days + NICU occupied bed-days
- Non-ICU bed-days = Total bed-days – ICU bed-days.

Statistical methods

The relative risks for incidence rate comparisons were calculated using the “ir” command in Stata version 11.

Surveillance definitions

Surveillance definitions can be found at the following web page:
http://www.sahealth.sa.gov.au/infectionprevention

Hospital type

The contributing institutions were divided into three categories based on a combination of the size and characteristics described by the AIHW Peer Groups[3]. Type 1 incorporates public acute group A and principal referral hospitals as well as specialist women’s and children’s hospitals; while type 2 incorporates public acute group B and three larger country hospitals from public acute group C. Private contributors have been grouped together into the PRIV category.

[#]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 1: Participating hospitals

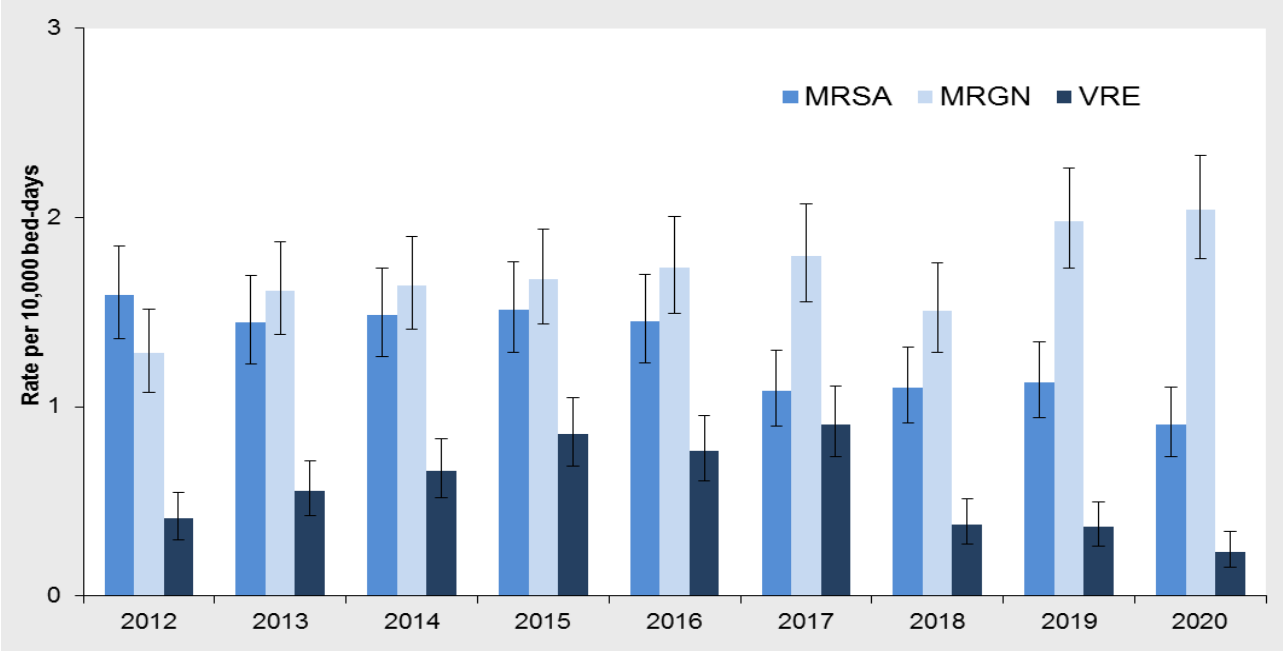
Public Hospitals	Type	Private Hospitals	Type
Flinders Medical Centre	1	Ashford Hospital	PRIV
Lyell McEwin Hospital	1	Burnside Hospital	PRIV
Modbury Hospital	1	Calvary Adelaide Hospital	PRIV
Queen Elizabeth Hospital	1	Calvary North Adelaide Hospital	PRIV
Repatriation General Hospital (co-located at Flinders Medical Centre)	1	Flinders Private Hospital	PRIV
Royal Adelaide Hospital	1	Memorial Hospital	PRIV
Women's & Children's Hospital	1	North Eastern Hospital	PRIV
Noarlunga Hospital	2	St. Andrew's Hospital	PRIV
Mount Gambier Hospital	2	Western Hospital	PRIV
Port Augusta Hospital	2		
Port Lincoln Hospital	2		
Port Pirie Hospital	2		
Riverland (Berri) Regional Services	2		
Whyalla Hospital	2		

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. Figure 1 shows 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 hospitals.

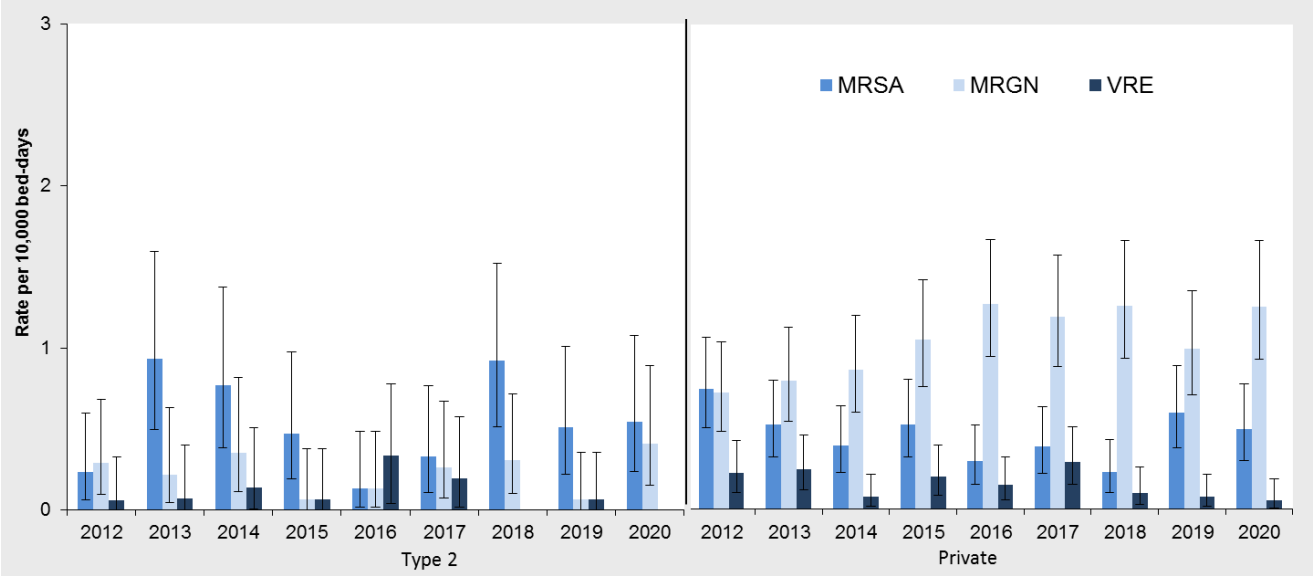
Figure 1: Healthcare-associated infection rates for MRSA, VRE and MRGN, type 1 hospitals by year, SA, 2012-2020



The overall MRSA infection rate for type 1 hospitals has decreased from 1.1 per 10,000 bed-days in 2019 to 0.9 per 10,000 bed-days in 2020 (p=0.05). There has also been a decrease in the rates of infection with VRE from 0.4 per 10,000 bed-days in 2019 to 0.2 per 10,000 bed-days in 2020 (p=0.03). Over the last two years, the rate of MRGN infection remained steady at 2.0 per 10,000 bed-days. (See Figure 1)

The overall MRO infection rates for type 2 and private hospitals 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. Trends are shown in Figure 2.

Figure 2: Healthcare-associated infection rates for MRSA, VRE and MRGN, type 2 and private hospitals by year, SA, 2012-2020



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.

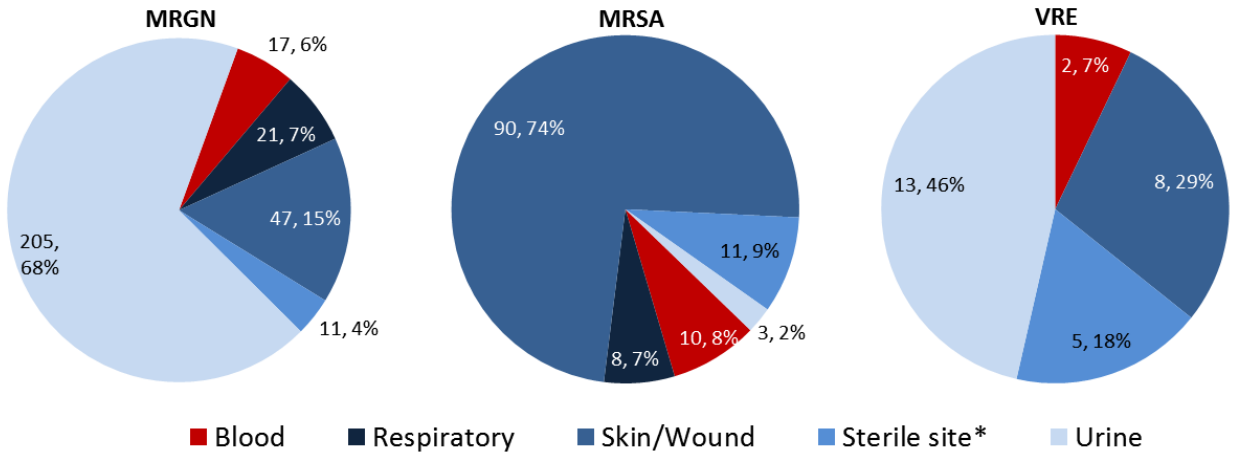
No conclusions on trends in these smaller facilities can be made due to the low numbers of cases and consequent high degree of variability each year (as illustrated by the wide confidence intervals around the data points).

a. Primary site of MRO acquisition

A large percentage of total new acquisitions for MRSA (36%) and VRE (80%) are identified through routine screening, in contrast, for MRGN almost all new acquisitions were detected in clinical specimens. With the exception of carbapenemase-producing Enterobacterales (CPE), there is no routine screening for MRGN carriage due to difficulties in laboratory detection processes from screening specimens.

Figure 3 shows the distribution of new MRO acquisitions by specimen collection site for 2020, excluding routine screening specimens. The primary site of acquisition recorded for MRSA was skin/wound (74%), and the primary site was urinary tract (urine) for MRGN (68%) and VRE (46%).

Figure 3: Cases and proportions of MRO by the primary site of acquisition (excluding screening), SA, 2020



** Tissue or body fluid collected from a sterile body site other than blood.*

b. MRO bloodstream infections

The following table shows the number of bloodstream infections (BSI) caused by multi-resistant organisms over recent years. The most frequently identified MROs causing BSI continue to be MRSA and multi-resistant *Escherichia coli.*

The number of episodes per organism are too small to draw conclusions regarding trends over time. For further discussion of bloodstream infections, refer to the SA Health Healthcare Associated Bloodstream Infection Report.

Table 2: MRO bloodstream infections by organism and year, SA, 2012-2020

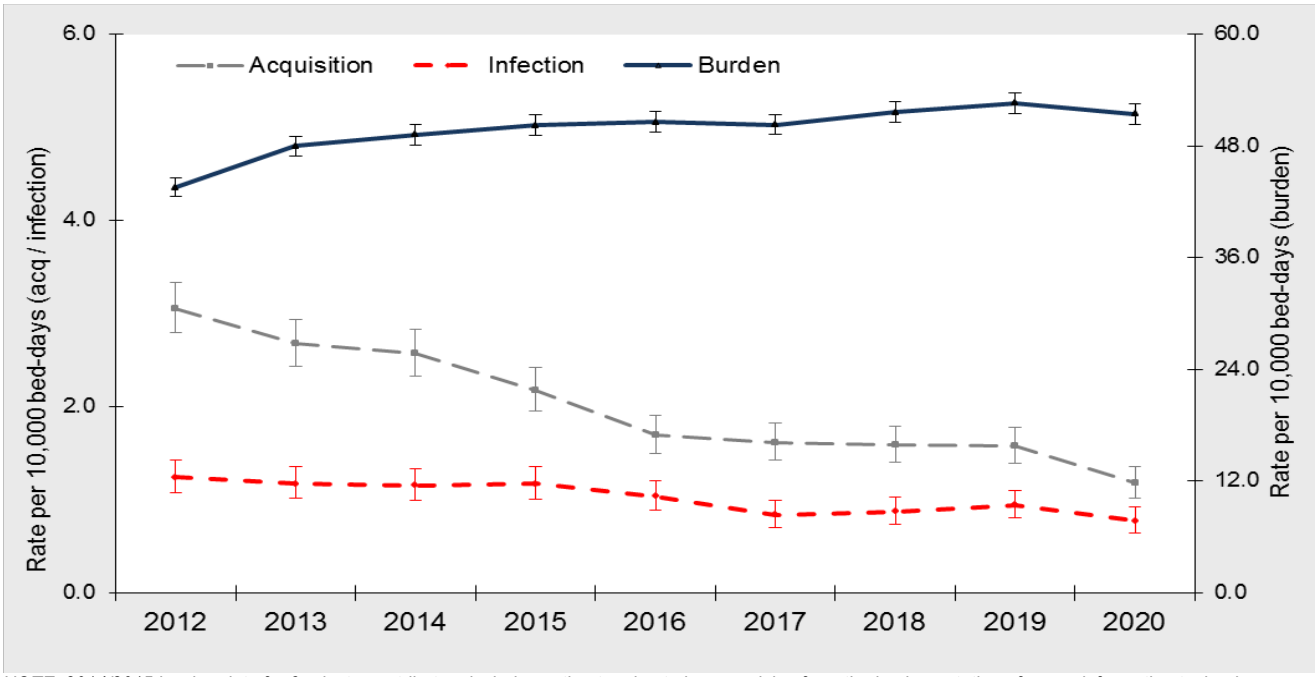
Resistance	Organism	2012	2013	2014	2015	2016	2017	2018	2019	2020
MRSA	Methicillin resistant *Staphylococcus aureus*	35	27	18	22	28	25	24	18	16
VRE	Vancomycin-resistant *Enterococcus faecium*	19	20	32	28	21	32	18	17	4
MRGN	*Escherichia coli*	15	19	15	21	15	19	19	28	14
	Pseudomonas aeruginosa	1	1	3	6	3	7	5	4	2
	Klebsiella pneumoniae	4	5	4	7	2	2	4	5	2
	Klebsiella oxytoca							1		
	Klebsiella sp					1				
	Acinetobacter baumannii				1					
	Enterobacter cloacae	3	2		1	1	1	1	1	
	Enterobacter aerogenes							2		
	Enterobacter sp		1		3	1	3			
	Citrobacter freundii						1		1	2
	Citrobacter sp	2								
	Proteus mirabilis		1	1						
	Serratia marcescens								1	
	Serratia sp					1				
	Total	**79**	**76**	**73**	**89**	**73**	**90**	**74**	**75**	**40**

2. Methicillin-resistant *Staphylococcus aureus* (MRSA)

Healthcare associated infections (HAIs) 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 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. Figure 4 summarises trends for all three indicators.

Figure 4: MRSA infection and acquisition rates compared to the overall burden of MRSA, SA, 2012-2020



NOTE: 2014/2015 burden data for 3 private contributors includes estimates due to issues arising from the implementation of a new information technology system.

The most robust measure of MRSA control is the infection rate, since this is not affected by variation in screening practices over time. This rate has decreased from 1.2 per 10,000 bed-days in 2012 to 0.8 per 10,000 bed-days in 2020, although a slight upward trend was noted from 2017 to 2019. A total of 125 cases of health-care associated MRSA infections were reported in 2020, compared to 159 in 2019.
Previous colonisation with MRSA has been shown to be associated with an increased risk of MRSA infection[5, 6]. Of the 125 healthcare-associated MRSA infections reported in 2020, 27 (22%) occurred in patients known to be already colonised with this organism.

The aggregate rate of MRSA acquisition has declined significantly over eight years from 3.1 per 10,000 bed-days in 2012 to 1.2 per 10,000 bed-days in 2020 ($p<0.001$). Although this rate can be affected by changes in screening practices, there is no evidence that hospital screening policies for MRSA have changed substantially over this period of surveillance.

a. 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 units partly due to the highly invasive nature of medical intervention in patients requiring ICU. However, the total number of infections in ICU patients is relatively small.

Table 3 shows numbers of MRSA infections in 2020 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.

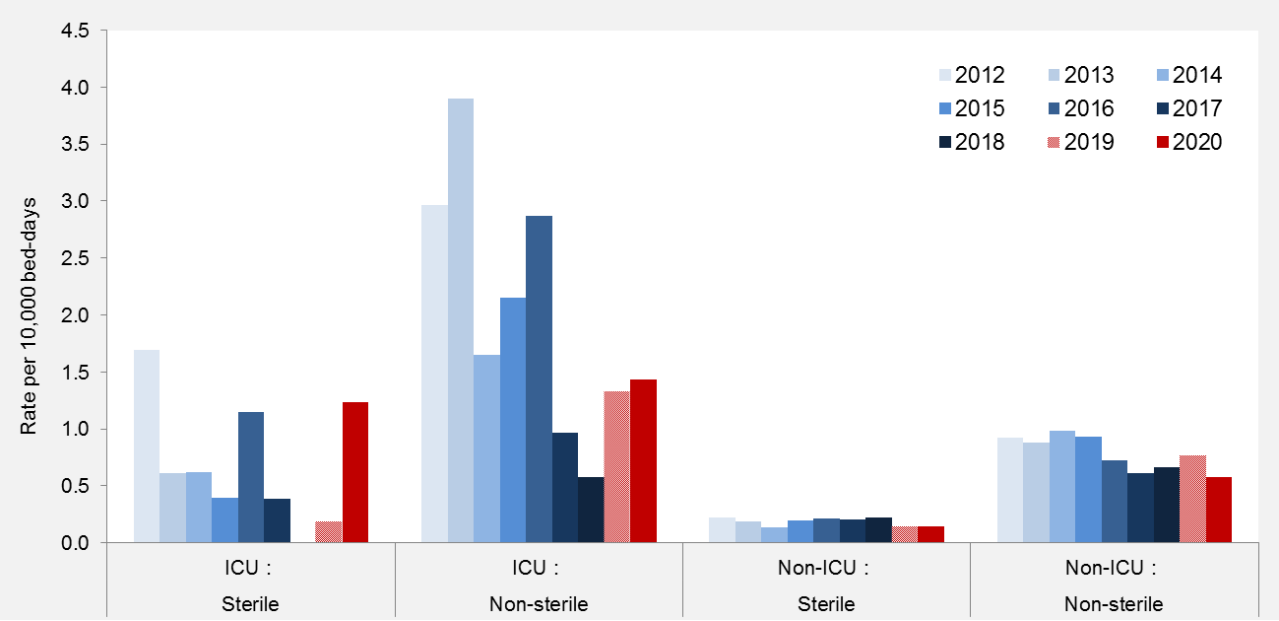
Table 3: MRSA and total MRO infections by patient location and specimen classification, SA, 2020

Patient Location: Specimen Site	Number of bed-days	HAI MRSA		Total HAI MRO	
		Count	Rate per 10,000 bed-days[CI_{95}]	Count	Rate per 10,000 bed-days[CI_{95}]
ICU: Sterile Site	48768	6	1.23 [0.45 - 2.68]	12	2.46 [1.27 - 4.30]
ICU: Non-sterile Site	48768	7	1.44 [0.58 - 2.96]	31	6.36 [4.32 - 9.02]
Total ICU	**48768**	**13**	**2.67 [1.42 - 4.56]**	**43**	**8.82 [6.38 - 11.9]**
Non-ICU: Sterile Site	1562791	22	0.14 [0.09 - 0.21]	61	0.39 [0.30 - 0.50]
Non-ICU: Non-sterile Site	1562791	90	0.58 [0.46 - 0.71]	323	2.07 [1.85 - 2.30]
Total Non-ICU	**1562791**	**112**	**0.72 [0.59 - 0.86]**	**384**	**2.46 [2.22 - 2.72]**
Grand Total	**1611559**	**125**	**0.78 [0.65 – 0.92]**	**427**	**2.65 [2.40 – 2.91]**

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

Figure 5 shows the trend in MRSA infections by infection type and patient location (ICU or non-ICU) over the past 8 years. The rate of ICU non-sterile MRSA infections increased from a low rate of 0.6 per 10,000 bed-days in 2018 to 1.4 per 10,000 bed-days in 2020, while the ICU rate of MRSA in sterile sites increased from 0.0 per 10,000 bed-days in 2018 to 1.2 per 10,000 bed-days in 2020.

Figure 5: MRSA infection rate by patient location and specimen classification by year, SA, 2012-2020



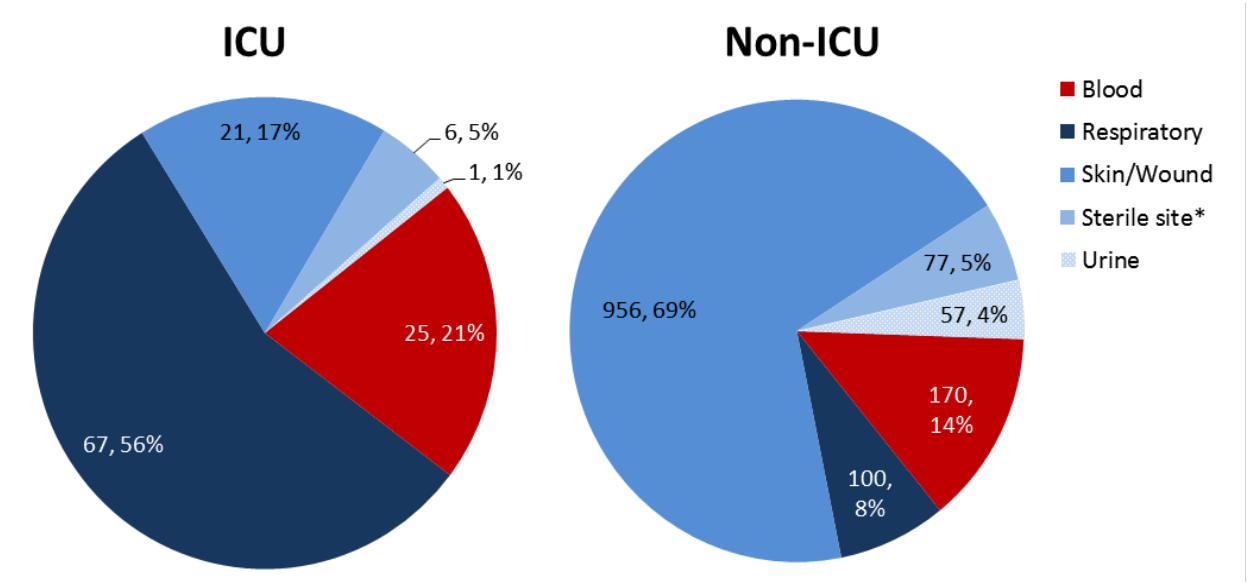
NOTE: Data include records from all intensive care units, including adult, paediatric and neonatal.

b. Primary body site of MRSA infection

The data presented in Figure 6 below show marked differences in the primary body site of infection with MRSA according to patient location. The data are combined for the 2012-2020 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 (69%). Amongst non-ICU patients a sizable proportion of MRSA infections also occur in the bloodstream and other sterile body sites (20% in total).

Figure 6: Cases and proportions of MRSA infections by primary site and patient location, SA, 2012-2020 combined

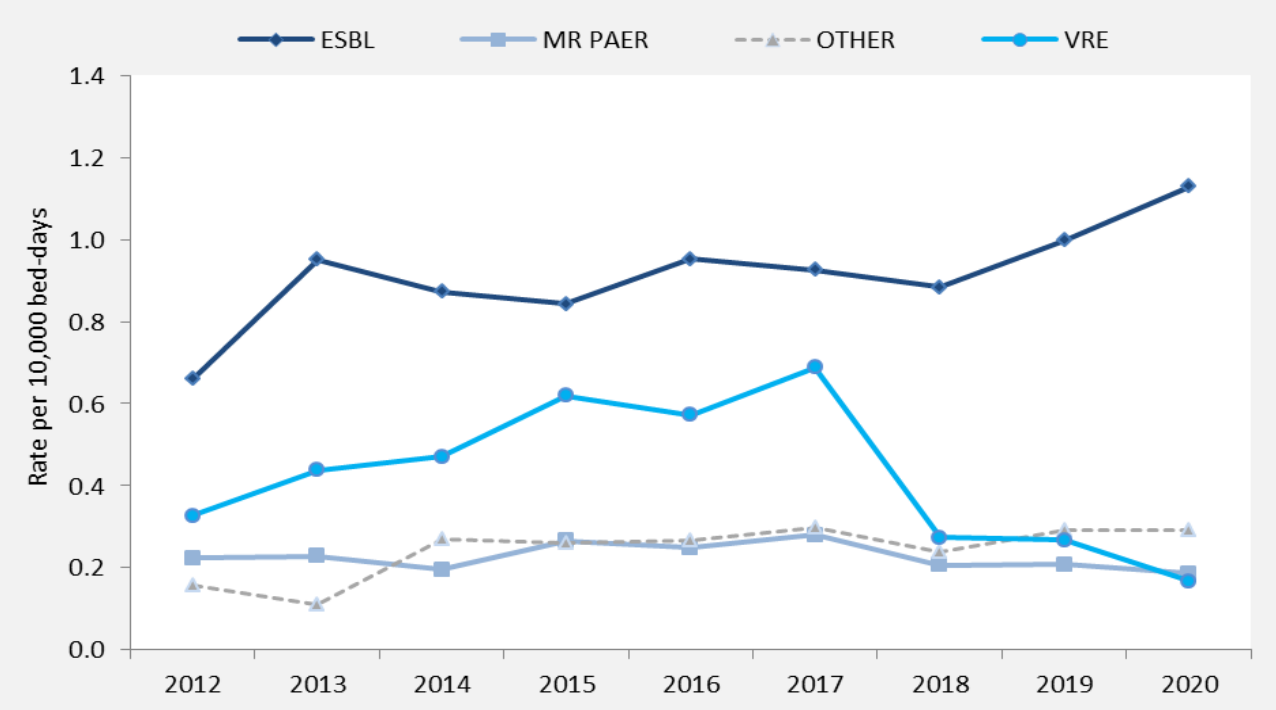


** Tissue or body fluid collected from a sterile body site other than blood.*

3. Multidrug-resistant organisms (other than MRSA)

Figure 7 shows the trend in annual infection rates for multidrug-resistant organisms other than MRSA, some of which have been rising steadily since 2012. The main increase in infection rates for this group of MROs is seen in extended spectrum beta-lactamase producers (ESBL).

Figure 7: The rate of MRO infections for all contributors by resistance category (excluding MRSA) and year, SA, 2012-2020.



*"Other" includes carbapenem-resistant Enterobacterales & Acinetobacter sp.

a. Vancomycin-resistant Enterococci (VRE)

The number of VRE infections decreased from 0.3 per 10,000 bed-days in 2019 to 0.2 per 10,000 bed-days in 2020.

Of the 27 VRE infections reported in 2020, 37% were in patients known to be already colonised with VRE. The predominant sites of VRE infection in 2020 were skin/wound and sterile sites (30% each) followed by the urinary tract (26%).

b. Multidrug-resistant Gram-negative bacteria (MRGN)

The MRGN group includes surveillance on the following resistance types: multidrug-resistant *Pseudomonas aeruginosa* (MRPAER), extended spectrum beta-lactamase producers (ESBL), carbapenem-resistant *Acinetobacter species* and Enterobacterales (CRGNB) and plasmid-mediated Amp C beta-lactamase producers (AMPC).

The rate of infections caused by ESBL-producing organisms has increased from 1.0 per 10,000 bed-days in 2019 to 1.1 per 10,000 bed-days in 2020. The main species found to be harbouring ESBL resistance determinants in 2020 were *E. coli* (71%) followed by *Klebsiella species* (17%) and *Citrobacter species* (10%).

c. Critical antimicrobial resistance (CAR)

Carbapenemase-producing Gram-negative bacteria have developed resistance to carbapenems. Carbapenems are considered a class of last resort antibiotics for the treatment of serious infections with multidrug-resistant strains.

The numbers of carbapenemase-producing Enterobacterales (CPE) decreased from 21 isolates in 2019 to 6 isolates in 2020. Identified isolates included *Klebsiella pneumoniae* and *Escherichia coli*. The isolates in 2019 were predominantly associated with an outbreak in a type 1 facility.

Table 4: Healthcare-associated critical antimicrobial resistance acquisitions, by organism type, critical resistance type and year, 2012-2020

Organism	Critical resistance	2012	2013	2014	2015	2016	2017	2018	2019	2020
Acinetobacter sp.	OXA-23				1					
Escherichia coli	NDM						1		5	1
Escherichia coli	NDM, OXA-48-like, rmtB							1		
Escherichia coli	KPC								1	
Escherichia coli	OXA-48-like									1
Klebsiella oxytoca	NDM									1
Klebsiella pneumoniae	NDM								15	3
Klebsiella pneumoniae	NDM, OXA-48-like							1		
Klebsiella pneumoniae	NDM, rmtF							1		
Pseudomonas aeruginosa	AIM		1			1				
Pseudomonas aeruginosa	GES						2	1		
Total			**1**		**1**	**1**	**3**	**4**	**21**	**6**

**includes specimens with more than one resistant organism i.e. patients may be included more than once.*

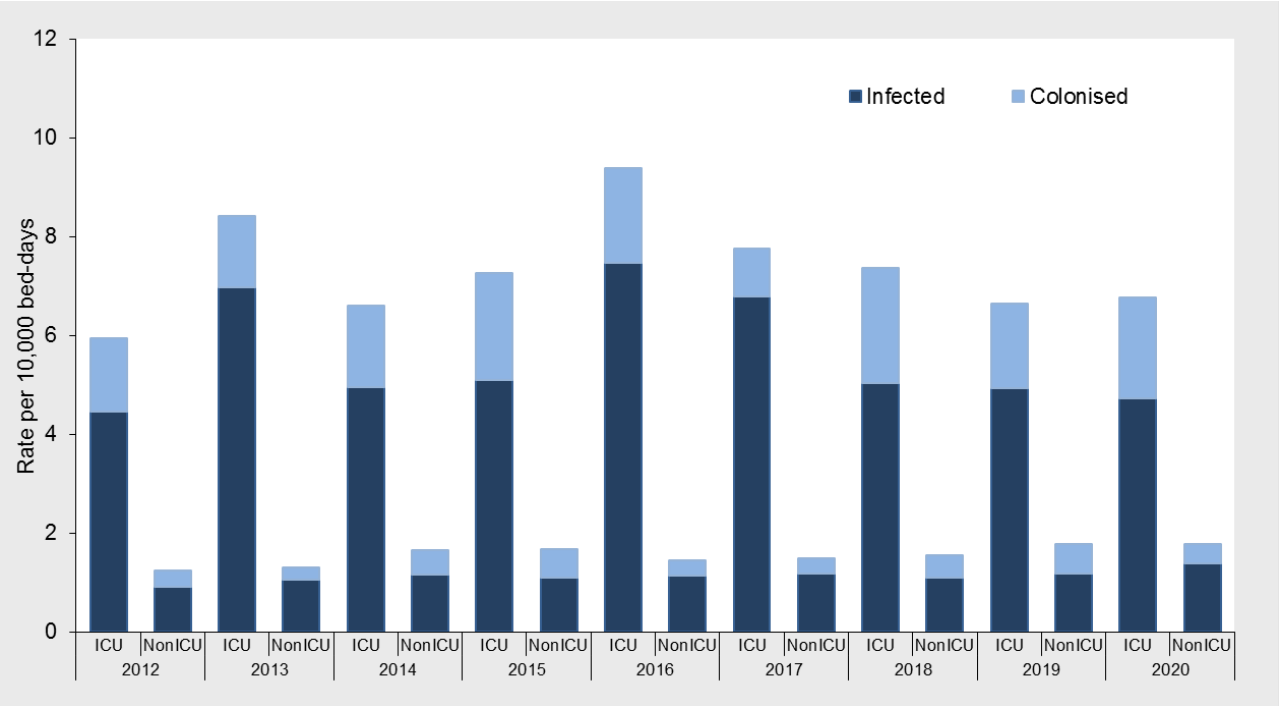
Additional information and national reports on critical antimicrobial resistance in Australia are available from the Australian Commission on Safety and Quality in Health Care (ACSQHC) critical antimicrobial resistance webpage. See https://www.safetyandquality.gov.au/our-work/antimicrobial-resistance/antimicrobial-use-and-resistance-australia-surveillance-system-aura/national-alert-system-critical-antimicrobial-resistances-caralert.

d. 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 MROs mainly because of their increased exposure to antibiotics and 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 Figure 8).

Figure 8: New MRGN acquisition rate, by ICU/non-ICU, infection status and year, SA, 2012-2020



Tables 5a and 5b show the number of MRO infections (excluding MRSA) per year stratified by resistance category and patient location.

Table 5a: MRO (excluding MRSA) infections* by resistance category – ICU by year, SA, 2012-2020

Resistance Code	2012	2013	2014	2015	2016	2017	2018	2019	2020
AMPC	2	2	3	3	6	8	10	1	3
CRGNB	0	0	1	2	1	0	0	1	1
ESBL	9	20	14	15	28	18	12	19	14
MRPAER (inc CRPAER)	12	13	8	11	10	11	4	11	9
VRE	11	16	9	10	11	11	8	6	3
Total	**34**	**51**	**35**	**41**	**56**	**48**	**34**	**38**	**30**

Table 5b: MRO (excluding MRSA) infections* by resistance category – non-ICU by year, SA, 2012-2020

Resistance Code	2012	2013	2014	2015	2016	2017	2018	2019	2020
AMPC	24	15	40	37	35	40	29	41	42
CRGNB#	0	1	0	0	1	1	0	6	1
ESBL	100	134	129	121	125	134	133	149	168
MRPAER (inc CRPAER)#	25	24	24	32	30	35	30	36	37
VRE	43	55	68	90	81	102	37	39	24
Total	**192**	**229**	**261**	**280**	**272**	**312**	**229**	**271**	**272**

** Note: these datasets also include infections from previously colonised patients.*
 # includes cases of transferable plasmid-mediated carbapenemase

MRO Benchmarking

For MROs, 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)[7] and VRE bloodstream infections in ICU patients collected by the Australian Council on Healthcare Standards (ACHS)[8].

The HISWA comparison data are presented in Table 6 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 6: MRSA clinical indicator descriptions and comparative data, SA versus HISWA

		Infection rate per 10,000 denominator			
		South Australia*		HISWA*	
		2018/19	2019/20	2018/19	2019/20
5.1	AICU-associated new MRSA infections in a ***sterile site***	0.00	0.75	0.21	0.63
5.2	AICU-associated new MRSA infections in a ***non-sterile*** site	1.14	1.00	1.29	1.26
5.3	Non ICU-associated new MRSA infections in a ***sterile site***	0.17	0.14	0.33	0.27
5.4	Non ICU-associated new MRSA infections in a ***non-sterile*** site	0.72	0.68	0.65	0.57

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

The South Australian 2019/20 MRSA infection rates for indicators 5.2, 5.3 and 5.4 are lower than those reported for 2018/19. However, there has been an increase in the rate of sterile site infections in adult ICU patients, from 0.00 per 10,000 bed-days in 2018/19 to 0.75 (n=3) in 2019/20.

The 2019/20 MRSA infections from adult ICU sterile and non-ICU non-sterile sites continue to be above those reported by Western Australia.

Table 7: ICU VRE bloodstream infections and comparative data, SA versus Australian Council on Healthcare, 2015-2019

	South Australia				Australian Council on Healthcare			
Year	Count of contrib	Count of VRE BSI	Count of bed-days	rate per 10000 bed-days	Count of contrib	Count of VRE BSI	Count of bed-days	rate per 10000 bed-days
2015	11	4	41265	0.97	45	49	138896	3.53
2016	11	4	41841	0.96	58	27	197927	1.36
2017	11	5	42620	1.17	53	23	183018	1.26
2018	11	4	42427	0.94	50	29	165964	1.75
2019	11	2	42745	0.47	53	18	181743	0.99

The South Australian ICU-associated VRE bloodstream infection rate for 2019 remains below that reported by the ACHS.

Acronyms

Table 8: Acronyms

AICU	Adult intensive care unit
AIHW	Australian Institute of Health and Welfare
AIM	Adelaide Imipenemase
AMPC	Plasmid-mediated AmpC beta-lactamase
CPE	Carbapenemase-producing *Enterobacterales*
CRGNB	Carbapenem-resistant *Acinetobacter species* and *Enterobacterales*
ESBL	Extended-spectrum beta-lactamase producing organisms
GES	Guiana extended-spectrum (GES) β-lactamases
HAI	Healthcare associated infections
HISWA	Healthcare Infection Surveillance Western Australia
ICP	Infection control professional
ICU	Intensive care unit
MBL	Metallo beta-lactamase
MRGN	Multidrug-resistant Gram-negative bacteria
MRO	Multidrug-resistant organism
MRPAER	Multidrug-resistant *Pseudomonas aeruginosa*
MRSA	Methicillin-resistant *Staphylococcus aureus*
NDM	New Delhi Metallo-beta-lactamase
NICU	Neonatal intensive care unit
OXA	Oxacillinase
PICU	Paediatric intensive care unit
rmt	Ribosomal methyltransferase
VRE	Vancomycin-resistant enterococci

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For more information

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