South Australian Healthcare-associated Infection Surveillance Program

Bloodstream Infection
Annual Report 2020

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SA Healthcare-Associated Infection Surveillance Program
Bloodstream Infection 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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Summary of Key Findings

- There were a total of 730 healthcare-associated bloodstream infections (HA-BSI) recorded in 2020, compared to 773 in 2019. Of the 730 infections, 111 (15%) occurred in patients that were classified as “non-inpatient” at the time of diagnosis. Sixty percent of non-inpatient episodes occurred in haematology/oncology patients.
- The aggregate rate of HA-BSI for contributing hospitals decreased from 4.6 episodes per 10,000 bed-days in 2019 to 4.5 episodes per 10,000 bed-days in 2020.
- Intravenous (IV) line-associated infections were the most common primary focus of HA-BSI in 2020 (26% of all episodes); followed by the gastrointestinal and urinary tracts at 19% each.
- The overall rate of HA-BSI associated with the presence of an indwelling medical device remained stable at 1.4 per 10,000 bed-days in 2020.
    - Central venous lines continue to be the most frequently identified type of device associated with HA-BSI, accounting for 69% of all device-associated episodes in 2020. The number of BSI episodes due to central venous lines decreased from 165 episodes in 2019 to 154 episodes in 2020, with peripherally-inserted central catheters (PICC) mainly attributing to the reduction.
- The rate of all-cause HA-BSI for intensive care unit (ICU) patients increased from 16.0 per 10,000 bed-days in 2019 to 19.5 per 10,000 bed-days in 2020. Approximately 36% of ICU attributed episodes were associated with an IV line. The rate of device-related infection in ICU patients increased from 5.3 episodes per 10,000 ICU bed-days in 2019 to 7.2 in 2020.
- The rate of all-cause HA-BSI for non-ICU patients remained relatively stable at 4.1 per 10,000 bed-days in 2020. The rate of device-related BSI in this patient group also remained stable around 1.2 per 10,000 bed-days in 2020.
- *Staphylococcus aureus* (*S. aureus*) accounted for approximately 16% of all HA-BSI episodes in 2020, and 12% of all *S. aureus* HA-BSI isolates were methicillin-resistant (MRSA). The aggregate rate of MRSA HA-BSI for all contributors in 2020 was 0.10 per 10,000 bed-days.
- While 63% of HA-BSI with a multi-resistant organism isolated were associated with extended-spectrum beta-lactamase (ESBL) producing organisms, there has been a decrease of 16 cases from 31 episodes in 2019 to 15 episodes in 2020.

Introduction

The Infection Control Service, Communicable Disease Control Branch, of the South Australian Department for Health and Wellbeing coordinates the collection of surveillance data on healthcare-associated bloodstream infection (HA-BSI), multidrug-resistant organisms, hospital-identified *Clostridium difficile* infection, surgical site infection and antimicrobial utilisation, and regularly reports the aggregated and individual hospital data to the contributors. The intention of this surveillance is to provide both public and private hospitals with information that assists them with their own quality improvement activities.

The South Australian statewide HA-BSI surveillance report has been generated from data contributed by 23 South Australian metropolitan and country hospitals (14 public and nine private facilities). HA-BSI surveillance commenced with seven major metropolitan hospitals in 1997 (five public and two private facilities). Enhanced surveillance using revised national HA-BSI definitions commenced in January 2002, with an additional 10 hospitals agreeing to contribute data at that time. Six Country Health SA Local Health Network hospitals commenced contribution to the state surveillance program from mid-2009; however, only data from January 2010 onwards have been included for these hospitals.

For benchmarking purposes, hospitals are grouped according to their size and level of patient acuity using the current Australian Institute of Health and Welfare peer groupings.

This report presents cumulative data on HA-BSI trends in South Australia, and updates the previous report published in 2019. The data presented give an indication of the burden of disease as well as identifying some possible areas for intervention.

Methods

HA-BSI data are collected by the infection control professional (ICP) of each of the participating hospitals in accordance with the South Australian surveillance definitions. Current definitions are available from the Infection Control Service website: www.sahealth.sa.gov.au/infectionprevention. Data are submitted monthly to the Infection Control Service and undergo quality checks prior to entry into the state surveillance database.

Numerator

All healthcare-associated positive blood cultures that occurred during the period of surveillance are included. Recurrent episodes with the same organism from the same source within 14 days of the original episode were excluded.

Episodes are classified as either inpatient (IP) acquired or non-inpatient (NIP) acquired in accordance with the South Australian bloodstream infection surveillance definitions.

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

Denominator

Denominator data, including specialty-specific bed-days, are provided by the Data and Reporting Services, System Performance Division, Department for Health and Wellbeing.

The denominator used for rate calculations in this report is called “bed-days”, including 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%)[(1)].

- Total bed-days = total patient days
- ICU bed-days = adult ICU patient days + paediatric ICU occupied bed-days + neonatal ICU occupied bed-days
- Non-ICU bed-days = total bed-days – ICU bed-days

For specific central-line associated BSI (CLABSI) rate calculations, the denominator is “central-line days” which is the sum of all days where the patient had a central intravenous line in place.

#An unqualified newborn is 9 days old or less and meets one of the following criteria[2]:

- *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.*

Attribution of probable source of HA-BSI

Wherever possible, the primary source of the HA-BSI is determined by the contributor using case-note review and/or discussion with the treating doctor or an infectious diseases specialist, in accordance with agreed definitions.

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. Due to the small number of private facilities in each AIHW private hospital peer group, private hospitals are grouped together (PRIV).

Statistical methods

95% confidence intervals (CI) were calculated using the Poisson CI calculator in Stata version 13, and the relative risks for incidence rate comparisons were calculated using the “ir” command.

Surveillance definitions

HA-BSI surveillance definitions can be found at the following web page:
www.sahealth.sa.gov.au/infectionprevention

Participating hospitals

Participating hospitals by AIHW Peer Group are shown in Table 1.

Table 1: Participating hospitals

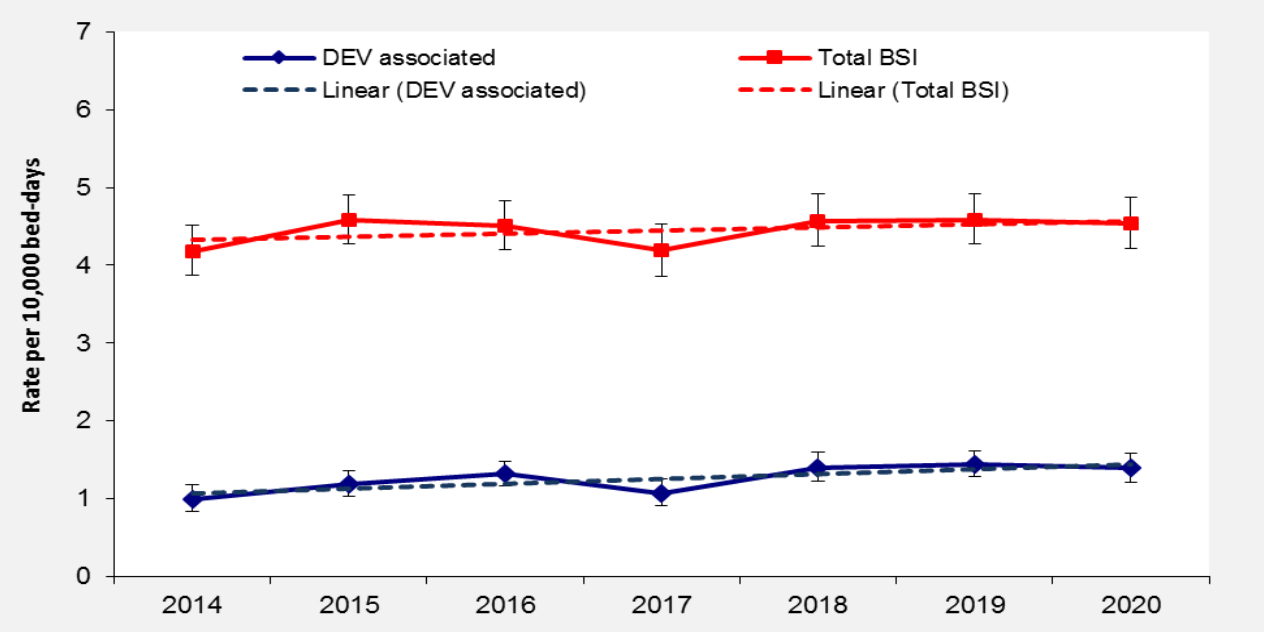
Public Hospitals	Type	Private Hospitals	Type
Flinders Medical Centre	1	Ashford Hospital	PRIV
Lyell McEwin Hospital	1	Burnside Hospital	PRIV
Modbury Hospital	1	Calvary North Adelaide Hospital	PRIV
Queen Elizabeth Hospital	1	Calvary Adelaide Hospital	PRIV
Repatriation General Hospital (co-located on FMC campus)	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. Andrews 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 Trend in Healthcare-associated Bloodstream Infection Rates

The total HA-BSI rate decreased slightly from 4.6 per 10,000 bed-days in 2019 to 4.5 per 10,000 bed-days in 2020 while the indwelling medical device-associated BSI rate remained stable at 1.4 per 10,000 bed-days in 2020. Further analysis on primary source/focus can be found in section 3.

Figure 1: Aggregate annual healthcare-associated bloodstream infection rates for all contributing hospitals, total and device-associated (error bars: 95% CI) by year, SA, 2014-2020



*DEV = indwelling medical device

Table 2 shows overall and device-associated BSI episodes and rates by hospital type. For type 1 hospitals the rate of overall HA-BSI has decreased from 5.7 per 10,000 bed-days in 2019 to 5.3 per 10,000 bed-days in 2020. Both private and type 2 facilities showed increases in the overall HA-BSI rates for 2020 compared to 2019.

Table 2: Rate and number of total and device-associated bloodstream infections by hospital type and year, SA, 2018-2020

	Hospital Type	2018			2019			2020		
		Episodes	Bed-days	Rate*	Episodes	Bed-days	Rate*	Episodes	Bed-days	Rate*
Overall BSI	Type 1	595	1081150	5.5	641	1125272	5.7	571	1082751	5.3
	Type 2	26	162789	1.6	18	156464	1.2	30	146417	2.0
	PRIV	129	396878	3.3	114	402693	2.8	129	382391	3.4
	Total BSI	**750**	**1640817**	**4.6**	**773**	**1684429**	**4.6**	**730**	**1611559**	**4.5**
Device associated BSI	Type 1	176	1081150	1.6	193	1125272	1.7	171	1082751	1.6
	Type 2	10	162789	0.6	8	156464	0.5	5	146417	0.3
	PRIV	44	396878	1.1	41	402693	1.0	48	382391	1.3
	Total DEV	**230**	**1640817**	**1.4**	**242**	**1684429**	**1.4**	**224**	**1611559**	**1.4**

*Rate per 10,000 patient bed-days

Although type 1 hospitals have made some improvements, higher rates are observed in type 1 and private hospitals compared to most type 2 facilities and are likely to be explained, at least in part, by differences in hospital casemix, with the larger type 1 and private hospitals offering a broader range of specialist services.

Patients in type 1 facilities have a higher intrinsic risk of developing BSI due to often multiple underlying co-morbidities, and more frequent use of invasive procedures. Therefore, differences in patient mix between hospitals will have a major impact on overall HA-BSI rates.

a. Bloodstream infections by patient status

Table 3 shows aggregate HA-BSI episodes by place of acquisition (inpatient *versus* non-inpatient status at the time of diagnosis) for all 23 contributing hospitals from 2014 to 2020. Approximately 15% of all episodes in 2020 occurred in patients who were receiving non-inpatient care at the time of diagnosis.

Table 3: Total healthcare-associated bloodstream infections, by patient status and year, SA, 2014-2020

Year	No. of BSI episodes			Percentage Non-inpatient (NIP)
	Inpatient (IP)	Non-inpatient (NIP)	Total	
2014	564	121	685	17.7%
2015	595	144	739	19.5%
2016	625	99	724	13.7%
2017	583	105	688	15.3%
2018	649	101	750	13.5%
2019	634	139	773	18.0%
2020	619	111	730	15.2%
Total	**5422**	**1054**	**6476**	**16.3%**

In 2020, the majority of IP episodes have occurred in patients admitted under surgical units (31%) followed by haematology/oncology (25%) and general medicine (23%), while the majority of NIP episodes over this time period have occurred in haematology/oncology patients (60%) and surgical patients (24%).

2. Analysis by Clinical Specialty

Analysis of data by specialty helps to illustrate the differences in intrinsic patient risk between different specialties and allows for trends within each specialty to be monitored. The dataset used to construct Table 4 includes all episodes of HA-BSI for all contributors, including both IP and NIP classified events.

Table 4: Rate and number of healthcare-associated bloodstream infection rates, by specialty and year, SA, 2019-2020

Clinical Unit	2019			2020			p value (2019-2020 rates)
	Episodes	Bed-days	rate#	Episodes	Bed-days	rate#	
Cardiac Surgery	10	24450	4.1	8	26338	3.0	0.27
Cardiology	25	68637	3.6	30	65956	4.5	0.21
Gastroenterology	32	33041	9.7	26	29774	8.7	0.35
General Medicine	141	428752	3.3	145	397997	3.6	0.19
General Surgery	118	145733	8.1	112	145602	7.7	0.35
Gynae/Obstetrics	13	95015	1.4	10	93856	1.1	0.28
Haematology/Oncology	203	79265	25.6	194	71592	27.1	0.29
Neonatology	11	58250	1.9	17	45701	3.7	0.04
Nephrology	24	90952	2.6	28	95618	2.9	0.36
Neurosurgery	13	24790	5.2	12	23553	5.1	0.47
Orthopaedic	32	116280	2.8	24	105099	2.3	0.25
Other*	50	229795	2.2	29	240892	1.2	0.01
Other Surgical Specialties^	72	110186	6.5	56	102481	5.5	0.16
Paediatric Haematology/Oncology	17	3125	54.4	25	4642	53.9	0.48
Paediatric Medicine	2	49462	0.4	2	39001	0.5	0.41
Paediatric Surgery	1	16097	0.6	4	15089	2.7	0.10
Unassigned	0	86662	0.0	0	87368	0.0	0.50
Vascular	9	23937	3.8	8	21000	3.8	0.49

* *Other* includes Accident and Emergency, intensivist, palliative care, psychiatry and rehabilitation.
^ Other surgical specialties includes Burns, Ear, Nose and Throat (ENT) and Oral, Urology, Thoracic and Plastic surgery
# Rate per 10,000 bed-days

While there was variation in HA-BSI rates for many specialties in 2020 compared to 2019, only two specialties had statistically significant changes. Of note:

- the HA-BSI rate associated with clinical units in the Other* category decreased from 2.2 per 10,000 bed-days in 2019 to 1.2 per 10,000 bed-days in 2020 (p=0.01),
- the rate of HA-BSI in neonatology increased from 1.9 per 10,000 bed-days in 2019 to 3.7 per 10,000 bed-days in 2020 (p=0.04), representing an increase of six BSI episodes.

a. Intensive Care Unit associated episodes

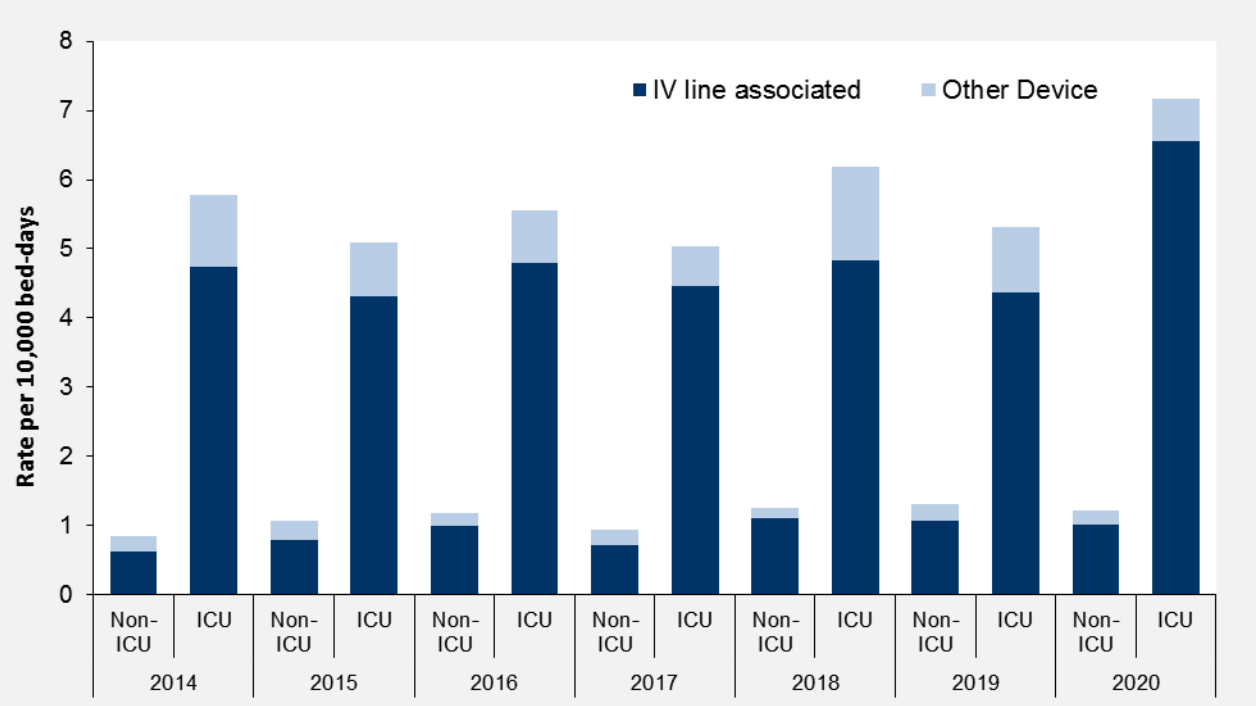
The risk of BSI is inherently higher in critically ill patients due to underlying co-morbidities and more invasive medical procedures, and analysis by ICU status (includes adult, paediatric and neonatal) demonstrates this increased risk.

There were 95 cases of HA-BSI in ICU patients in 2020, representing a 12% increase from 84 cases in 2019. The aggregate rate of HA-BSI for all ICU patients increased from 16.0 per 10,000 bed-days in 2019 to 19.5 per 10,000 bed-days in 2020, while the corresponding rate of HA-BSI for non-ICU patients decreased from 4.2 per 10,000 bed-days in 2019 to 4.1 per 10,000 bed-days in 2020.

Indwelling medical devices were deemed responsible for approximately 37% of all ICU-associated episodes in 2020. Of the 88 ICU-associated episodes in 2020 where a specific primary focus could be identified, IV lines were the most frequently identified source accounting for the largest proportion of episodes (36%), followed by the respiratory tract (18%), the gastrointestinal tract (13%) and the urinary tract (13%). The proportion of ICU-associated episodes where the source was unknown or recorded as disseminated has decreased from 36% in 2010 to 6% in 2019.

Figure 2 shows a breakdown of medical device-associated BSI episodes according to patient location since 2014.

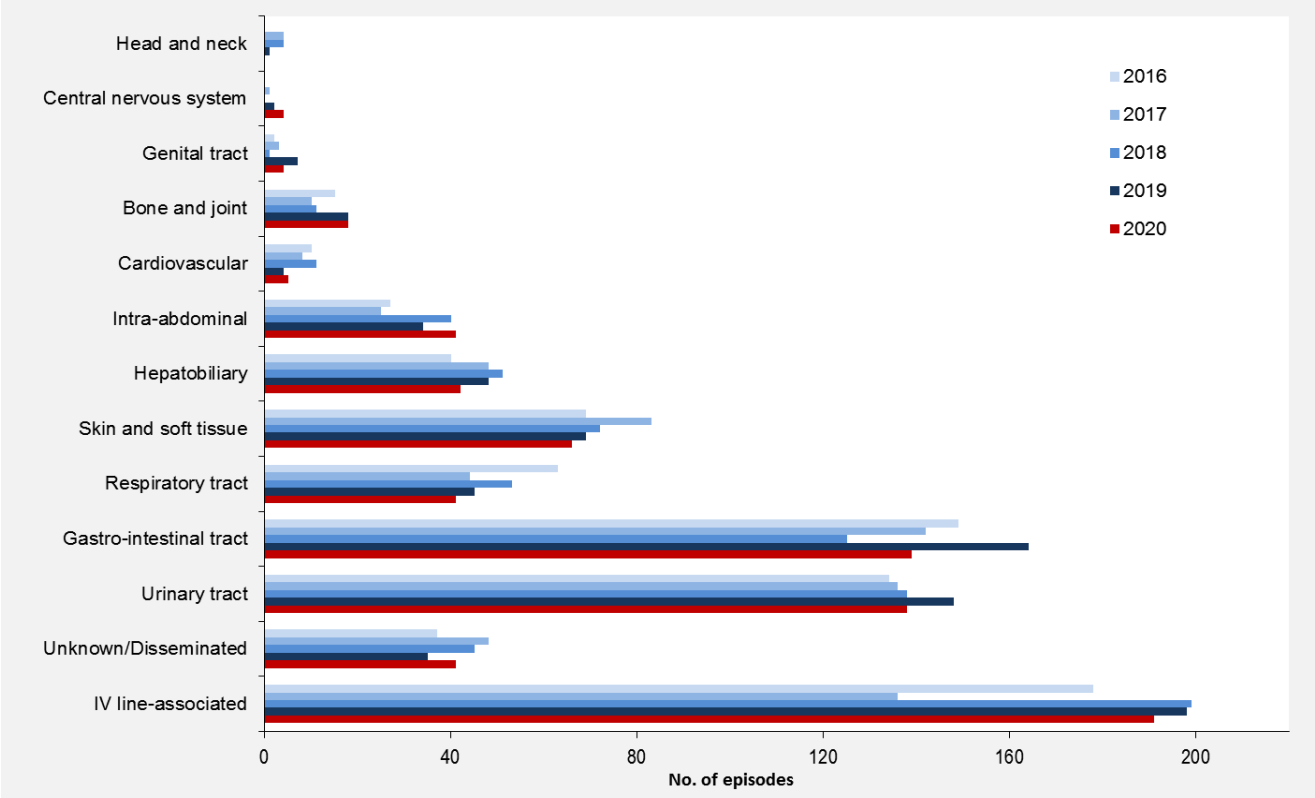
Figure 2: Rate of device-associated bloodstream infection episodes according to ICU status, by device type and year, SA, 2014-2020



3. Analysis by Primary Focus/Source

Establishing a likely infection focus or primary source of HA-BSI may be useful for directing appropriately targeted improvement activities and allows for monitoring of the effect of implemented interventions. Figure 3 shows a breakdown of all HA-BSI episodes for all contributors by the primary infection focus for the past five years.

Figure 3: Primary focus of healthcare-associated bloodstream infection, by year, SA, 2016-2020



For 2020 the most common primary focus was an IV line, accounting for 26% of all episodes. The number of BSI episodes attributed to an IV line decreased slightly from 191 episodes in 2020 compared to 198 episodes in the previous year. Central lines account for 81% of all IV line associated BSI, the principal line type connected with central line episodes was peripherally inserted central lines (PICC).

The second most common primary focus of HA-BSI in 2020 was the gastro-intestinal tract and the urinary tract at 19% each. The majority of episodes associated with the gastro-intestinal tract as the primary focus, occurred in haematology/oncology (adult and paediatric) patients (68%), most likely due to the presence of mucositis secondary to cancer therapy.

Five percent (n=38) of HA-BSI episodes were reported as having a primary focus which could not be determined. Forty-five percent of these episodes were attributable to general medicine patients, 18% in haematology/oncology patients, while a further 11% occurred in cardiology patients.

Table 5 shows a further breakdown of all HA-BSI episodes in 2020 compared to 2019 by patient age category, device-related and procedure-related sources. The data show the decrease in HA-BSI episodes in 2020 have been mainly due to decreases in central line-associated episodes, urinary catheter related BSI and also HA-BSI which are not associated with either indwelling medical devices or medical procedures.

Table 5: Bloodstream infections by patient age group, source category and year, SA, 2019-2020

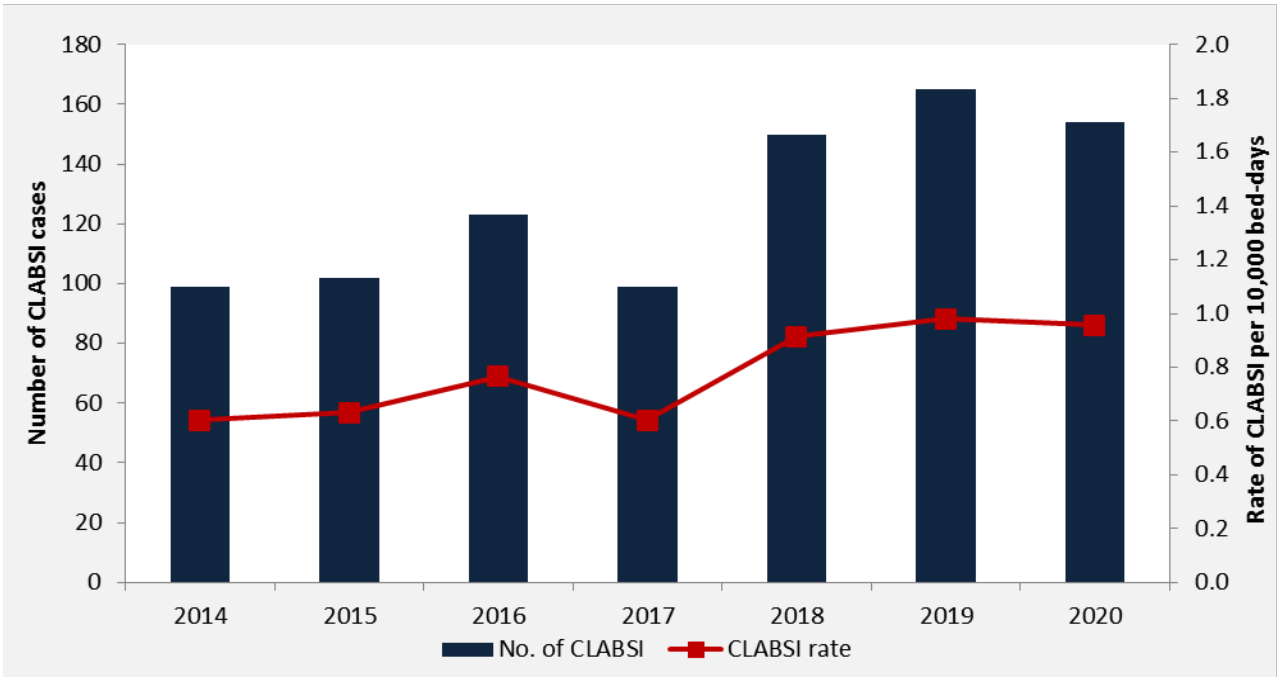
Source category	No. of episodes (% of total) 2019				No. of episodes (% of total) 2020			
	Adults	Children	Neonates	TOTAL	Adults	Children	Neonates	TOTAL
Device-associated:								
Central line	157	4	4	**165**	131	14	9	**154**
Peripheral line	30	0	0	**30**	32	0	0	**32**
other IV access	3	0	0	**3**	5	0	0	**5**
Urinary catheters	24	1	0	**25**	19	0	0	**19**
other devices*	19	0	0	**19**	13	0	1	**14**
TOTAL device-associated	**233 (31%)**	**5 (23%)**	**4 (36%)**	**242 (31%)**	**200 (30%)**	**14 (38%)**	**10 (59%)**	**224 (31%)**
Procedure Associated	124	0	0	**124**	123	2	0	**125**
Non-device/procedure	383	17	7	**407**	353	21	7	**381**
TOTAL	**740**	**22**	**11**	**773**	**676**	**37**	**17**	**730**

"Other IV access" includes arterial lines, vascath lines and lines of unknown type.
* "Other devices" includes tracheal tubes, shunts, stents, cardiac valves and pacemakers.

a. Intravenous device-associated bloodstream infections

Device-associated BSI episodes continue to account for a considerable proportion of all HA-BSI events (31% of the total in 2020); 85% of these were associated with IV lines. Central venous lines accounted for approximately 69% of all device-associated episodes in 2020. Figure 4 shows the trend in hospital-wide central line-associated BSI since 2014.

Figure 4: Number and rate of central line-associated bloodstream infection (CLABSI) cases by year, SA, 2014-2020



The number of CLABSI episodes decreased from 165 episodes in 2019 to 154 episodes in 2020. PICC accounted for 60% of all CLABSI episodes and were predominantly associated with the adult haematology/oncology specialty.

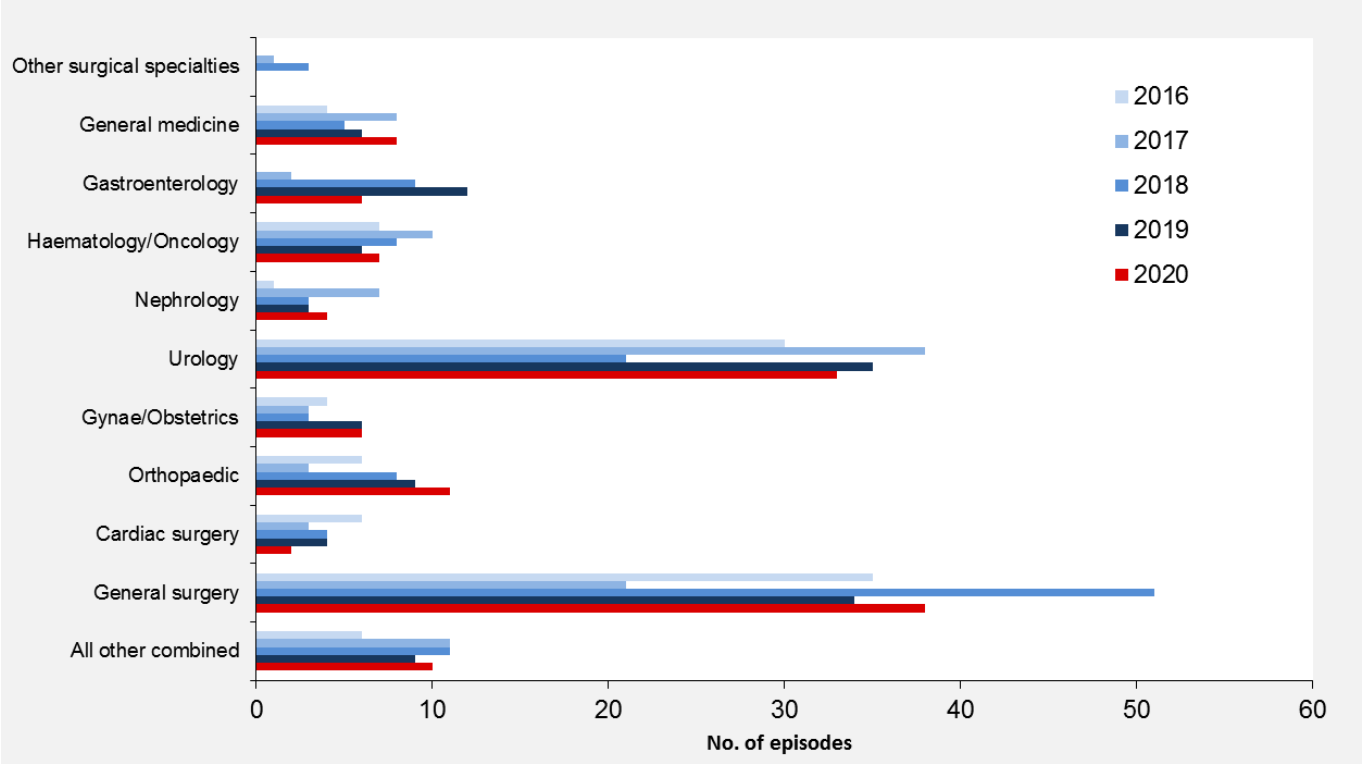
b. Other device-associated bloodstream infections

The data presented in Table 5 for devices other than IV lines shows there has been a decrease in episodes associated with indwelling urinary catheters from 25 episodes in 2019 to 19 episodes in 2020, as well as a smaller decrease in episodes associated with other types of indwelling medical device, such as endotracheal tubes, shunts, stents, cardiac valves and pacemakers, from 19 episodes in 2019 to 14 episodes in 2020.

c. Procedure-associated bloodstream infections

Figure 5 shows the number of procedure-associated BSI episodes by clinical specialty for the years 2016-2020.

Figure 5: Procedure-associated BSI by specialty group by year, SA, 2016-2020



Note: "other surgical specialties" includes Burns, Ear nose and throat (ENT), Oral surgery, Plastic surgery, Thoracic surgery.

The highest number of procedure-associated BSI episodes occurred in general surgery patients accounting for 30% of procedure-associated BSI during 2020. General surgery includes colorectal, hepatobiliary and gastrointestinal surgery, which involve procedures often associated with a higher risk of contamination of the surgical site.

Urology patients accounted for the next largest proportion (26%) of all procedure-associated BSI episodes in 2020; this reflects a slight decrease in procedure-associated episodes in urology patients from 35 episodes in 2019 compared to 33 episodes in 2020.

4. Analysis by Organism

Table 6 shows the distribution of microorganisms responsible for HA-BSI from 2014 to 2020.

Table 6: HA-BSI by organism type isolated from blood by year, SA, 2014-2020

Organism group	No. of episodes						
	2014	2015	2016	2017	2018	2019	2020
Total Gram positives	**245**	**259**	**271**	**250**	**265**	**280**	**265**
***Staphylococcus aureus* total**	*96*	*119*	*133*	*125*	*115*	*110*	*120*
Staphylococcus aureus (meth S)	80	101	106	105	92	92	106
Staphylococcus aureus (meth R)	16	18	27	20	23	18	14
coagulase negative staphylococci	38	33	43	43	64	70	68
Enterococcus spp.	75	70	66	68	68	72	54
Streptococcus spp.	36	37	29	14	18	28	23
Total Gram negatives	**302**	**292**	**312**	**287**	**299**	**305**	**302**
Escherichia coli	137	110	125	114	120	134	107
Escherichia spp	0	0	0	1	0	0	0
Pseudomonas aeruginosa	42	49	56	49	45	43	38
Klebsiella spp.	37	53	51	51	46	45	58
Enterobacter spp.	38	31	31	31	34	28	28
Proteus group	10	15	12	8	9	12	12
GNB other	38	34	37	33	45	43	59
Total other	**138**	**188**	**141**	**151**	**186**	**188**	**163**
Anaerobe	19	27	24	23	27	22	22
Candida/yeast	39	32	40	41	74	53	53
Miscellaneous other	10	16	16	13	16	26	10
Polymicrobial*	70	113	61	74	69	87	78
TOTAL	**685**	**739**	**724**	**688**	**750**	**773**	**730**

* Polymicrobial includes all episodes where more than one significant organism was isolated within a 48hr period.
- meth S = methicillin sensitive, meth R = methicillin resistant, GNB = Gram negative bacilli

S. aureus remains a key causative organism of HA-BSI, responsible for approximately 18% of all episodes (including polymicrobial episodes where *S. aureus* was one of the organisms isolated). Eighteen percent of all *S. aureus* BSIs in 2020 were acquired in NIP settings. The proportion of *S. aureus* BSIs caused by methicillin-resistant strains (MRSA) was 12% in 2020 (see next section for further analysis).

Escherichia coli (E. coli) also remain a major causative organism for HA-BSI, responsible for approximately 18% of episodes (including polymicrobial episodes where *E. coli was* one of the organisms isolated). The main sources of these episodes were the urinary tract (36%); the gastrointestinal tract (32%) and hepatobiliary primary focus (9%).

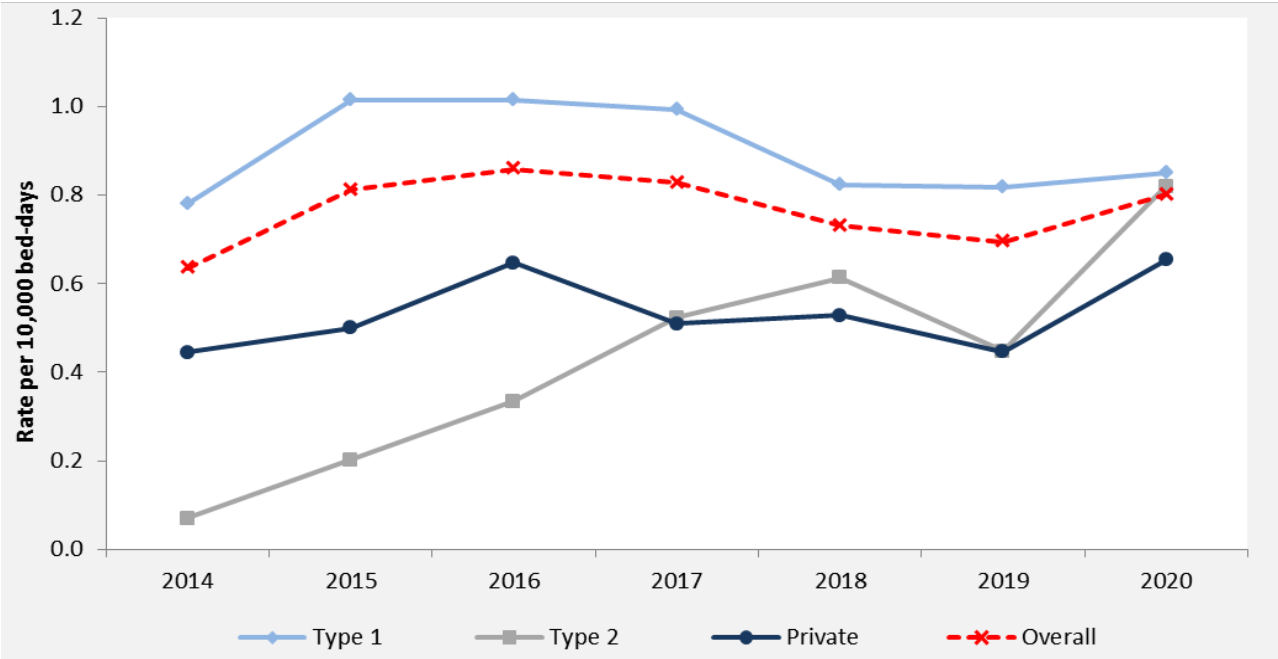
The proportion of HA-BSIs classified as polymicrobial has remained stable at 11% in 2020. Of the 78 polymicrobial episodes in 2020, nine included *S. aureus* as one of the bacteria isolated, and 23 included *E. coli.* The most frequently identified foci of polymicrobial episodes were IV lines (35%), followed by the gastrointestinal tract (28%), hepatobiliary tract (9%) and the urinary tract (6%). Polymicrobial episodes were associated with neutropenia in 27% of cases.

While yeast isolates have increased considerably (38%) since 2014; they only make up approximately 10% of HA-BSI. The most frequently identified focus in this group was the urinary tract (31%) followed by the gastrointestinal tract (26%) and IV line-associated episodes (22%).

a. *Staphylococcus aureus* bloodstream infection

Healthcare-associated *S. aureus* bloodstream infection (SABSI), also referred to as *S. aureus* bacteraemia (SAB), was endorsed as a hospital performance indicator for the National Health Care Agreement in 2009 and currently has a nationally agreed benchmark of no more than 1.0 cases per 10,000 bed-days[4]. Figure 6 shows the trend in SABSI rates for South Australian hospitals stratified by hospital type.

Figure 6: Rate of SAB by hospital peer group and year, SA, 2014-2020



The aggregate state SABSI rate for 2020 of 0.80 per 10,000 bed-days remains below the nationally set target of less than 1.0 per 10,000 bed-days. While the rate for type 1 facilities has remained stable at 0.8 per 10,000 bed-days, type 2 and private facilities have shown increases from 0.4 per 10,000 bed-days in 2019 to 0.8 per 10,000 bed-days in 2020 and from 0.4 per 10,000 bed-days in 2019 to 0.7 per 10,000 bed-days in 2020, respectively.

Table 7 presents the raw data by hospital type for the past three years, and shows the majority of SABSI episodes occur in type 1 public hospitals

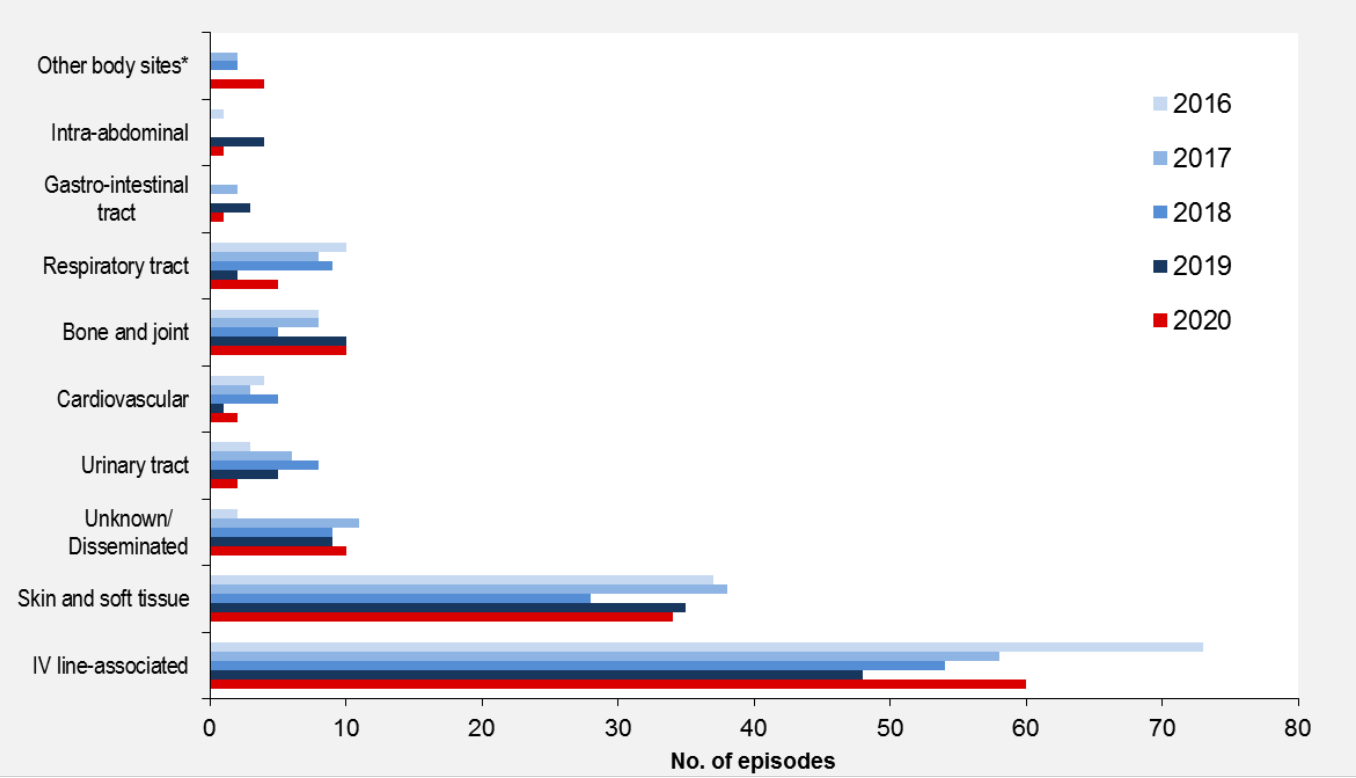
Table 7: SAB cases and rates by hospital peer group and year, SA, 2018-2020

Hosp Type	2018			2019			2020		
	Episodes	Bed-days	rate* [95% CI]	Episodes	Bed-days	rate* [95% CI]	Episodes	Bed-days	rate* [95% CI]
Type 1	89	1081150	0.8 [0.7 - 1]	92	1125272	0.8 [0.7 - 1]	92	1082751	0.8 [0.7 - 1]
Type 2	10	162789	0.6 [0.3 - 1.1]	7	156464	0.4 [0.2 - 0.9]	12	146417	0.8 [0.4 - 1.4]
PRIV	21	396878	0.5 [0.3 - 0.8]	18	402693	0.4 [0.3 - 0.7]	25	382391	0.7 [0.4 - 1]
Total SAB	**120**	**1640817**	**0.7 [0.6 - 0.9]**	**117**	**1684429**	**0.7 [0.6 - 0.8]**	**129**	**1611559**	**0.8 [0.7 - 1]**

Hosp = hospital; *Rate = episodes per 10,000 bed-days

Figure 7 shows a breakdown of SABSI episodes by primary focus of infection, for the years 2016 - 2020.

Figure 7: Healthcare-associated *S. aureus* bacteraemia by primary focus and year, SA, 2016-2020



*includes hepatobiliary, head and neck, and central nervous system
NOTE: this dataset includes polymicrobial episodes where *S. aureus* was one of the isolates.

As seen in Figure 7, the majority of SABSI episodes continue to be associated with IV lines (47% of all SABSI episodes in 2020) and are therefore potentially preventable. There has been an increase in the number of IV line-associated SABSI in 2020, from 48 episodes in 2019 to 60 episodes in 2020 in the context of a decreasing trend in the previous years.

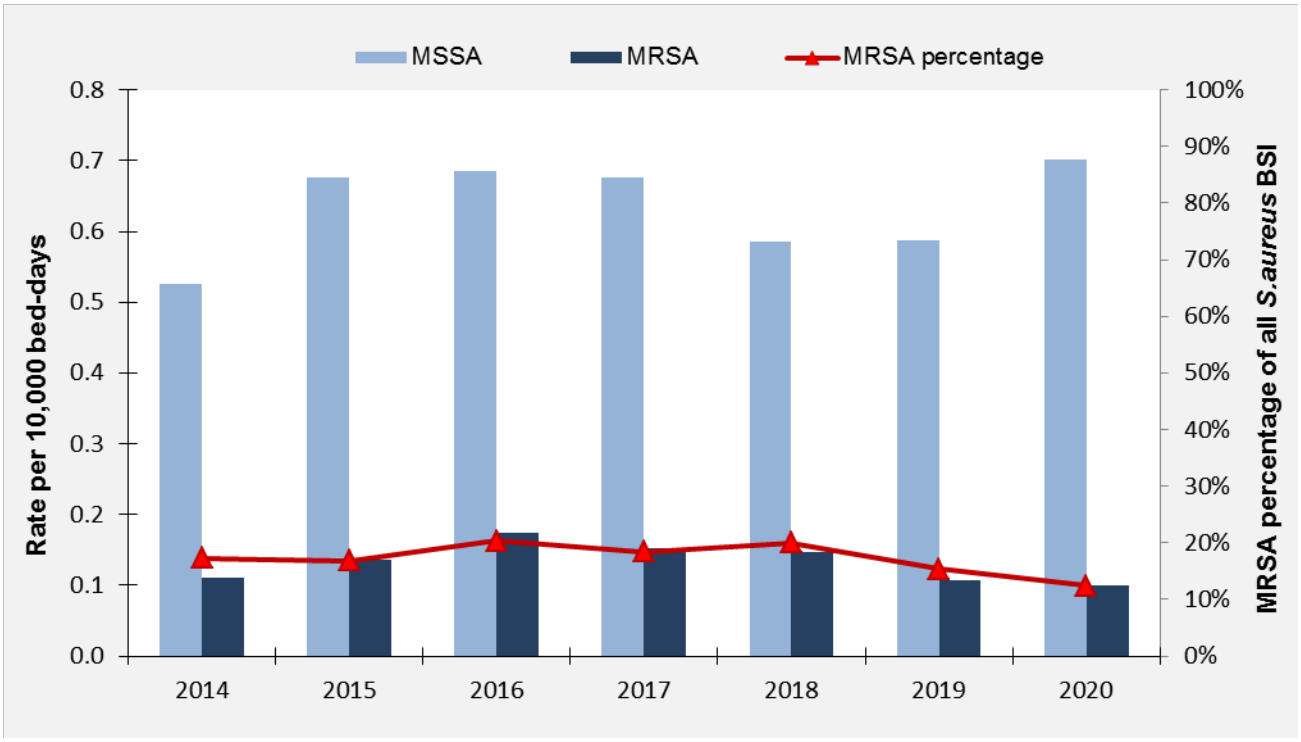
Skin and soft tissue associated BSI episodes continue to be a large focus of SABSI, the second most common (26%) primary focus for SABSI.

A small number (7%) of all SAB episodes in 2020 did not have a primary focus identified.

b. Methicillin-resistant *S. aureus*

Figure 8 shows the rate of SABSI per 10,000 bed-days since 2014, stratified by methicillin sensitivity (MSSA) or resistance (MRSA), and shows the percentage of all SAB which are due to MRSA.

Figure 8: *S. aureus* bloodstream infection rates by methicillin sensitivity or resistance and the percentage of methicillin-resistant *S. aureus* BSI, by year, SA, 2014-2020



The rate of MRSA HA-BSI has remained relatively stable around 0.10 per 10,000 bed-days in 2020, while the rate of HA-BSI due to MSSA has increased from 0.59 per 10,000 bed-days in 2019 to 0.70 per 10,000 bed-days in 2020. There was a decrease in the proportion of SABSI that were caused by MRSA from 15% in 2019 to 12% in 2020.

The rate of MRSA bloodstream infection is considered to be a useful indicator of infection prevention efforts to control morbidity due to MROs.

Patients in type 1 hospitals generally carry a higher risk of MRSA BSI due to the presence of more serious co-morbidities and greater use of invasive medical procedures, together with the higher burden of MRSA in the larger hospitals. The rate of HA-BSI caused by MRSA in type 1 facilities has decreased from 0.13 per 10,000 bed-days in 2019 to 0.10 per 10,000 bed-days in 2020, while type 2 and private hospitals have shown increases from 0.13 per 10,000 bed-days to 0.20 per 10,000 bed-days and 0.02 per 10,000 bed-days to 0.05 per 10,000 bed-days, respectively.

c. Other multidrug-resistant organisms

The number of episodes of HA-BSI due to other MROs according to resistance type for the past several years is shown in Table 8. For definitions of the various MRO categories see the MRO surveillance definitions available at: www.sahealth.sa.gov.au/infectionprevention

Table 8: Episodes of bloodstream infection due to multidrug-resistant organisms other than MRSA by year, SA, 2014-2020

Resistance category	2014	2015	2016	2017	2018	2019	2020
Plasmid-mediated AmpC beta-lactamase producers (AMPC)	5	6	8	4	7	4	3
Carbapenem-resistant Gram negative bacillis (CRGNB)*	0	1	1	1	0	1	0
Extended spectrum beta-lactamase producer (ESBL)	15	26	12	21	20	31	15
Metallo beta-lactamase producers (MBL)	0	0	0	0	0	0	0
Multi-resistant *Pseudomonas aeruginosa* (MRPAER)*	3	6	3	7	5	4	2
Vancomycin resistant enterococci (VRE)	32	28	21	32	18	17	4
Grand Total	**55**	**67**	**45**	**65**	**50**	**57**	**24**

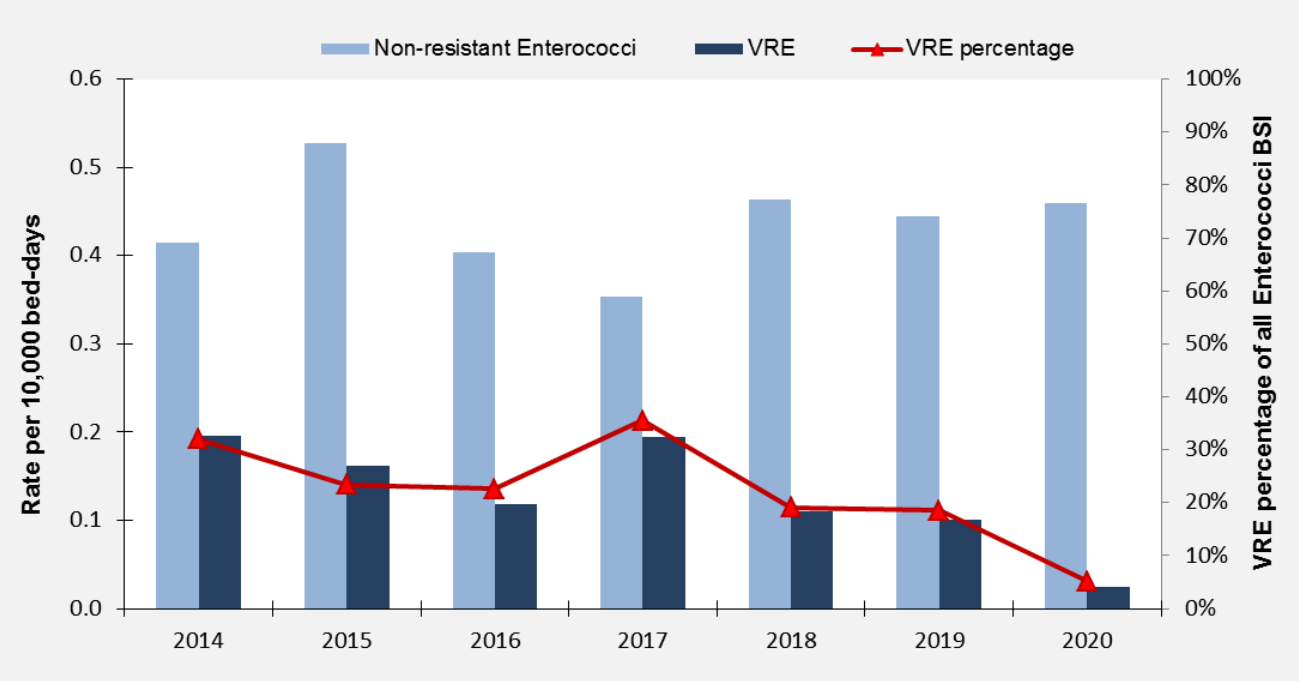
*includes carbapenemase-producing organisms

NOTE: this dataset includes polymicrobial episodes where the MRO was one of the isolates; cases may be counted more than once in aggregate MRO counts if the BSI had more than one MRO type.

ESBL producers account for the largest proportion of BSI due to MROs other than MRSA at 63%, however these BSI have shown a substantial decrease from 31 cases in 2019 to 15 cases in 2020.

HA-BSI due to ESBL producers have occurred predominantly in patients admitted under surgical units (47%) followed by haematology/oncology (20%). ESBL detection has been mainly seen amongst *E. coli* (11 out of 15 in 2020), all of which occurred in non-ICU patients. The primary source of infection for BSI caused by ESBL producers in 2020 was the urinary tract with nine episodes.

Figure 9: Rate of enterococcal bloodstream infection and percentage of vancomycin-resistant enterococcal BSI by year, SA, 2014-2020



The HA-BSI rate for enterococcal BSI has decreased from 0.55 per 10,000 bed-days in 2019 to 0.48 per 10,000 bed-days in 2020, with the proportion of these that are vancomycin-resistant, reducing from 18% in 2019 to 5% in 2020.

5. Benchmarking

a. *S. aureus* bacteraemia

SAB has been adopted as the primary clinical indicator for the national hand hygiene program, and the national Healthcare Agreement. Nationally agreed definitions have been developed for data collection and, although some minor variations in coverage and exclusions still exist, these definitions have enabled more effective benchmarking across a broader base. Table 9 presents data for each jurisdiction as submitted to the AIHW for the financial year 2019-2020[5].

Table 9: Number and rate of SABSI for public hospitals by state, July 1 2019 to June 30 2020

State	Episodes	Denominator	rate per 10,000 bed-days
Australian Capital Territory	32	397,001	0.81
New South Wales	506	6,651,835	0.76
Northern Territory	13	380,961	0.34
Queensland	271	4,057,359	0.67
South Australia	**107**	**1,490,040**	**0.72**
Tasmania	36	443,862	0.81
Victoria	359	5,161,314	0.70
Western Australia	104	1,468,973	0.71
Australia	**1428**	**20,051,345**	**0.71**

Table 9 shows that the South Australian SABSI rate is comparable to the national rate and is below the target of 1.0 per 10,000 bed-days.

Table 10 provides a comparison of annual MRSA HA-BSI rates between South Australia (SA), and Australia (AIHW)[6].

Table 10: Number and rate of MRSA HA-BSI for public hospitals for South Australia and Australia by financial year, 2013/14-2019/20

	SA			National		
	Episodes	Bed-days (BD)	Rate#	Episodes	Bed-days (BD)	Rate#
2013/14	24	1,511,695	0.16	388	18,172,000	0.21
2014/15	21	1,523,808	0.14	331	18,945,000	0.17
2015/16	16	1,469,000	0.11	278	19,608,100	0.14
2016/17	25	1,467,000	0.17	290	19,833,800	0.15
2017/18	24	1,430,300	0.17	267	20,453,200	0.13
2018/19	21	1,499,546	0.14	277	21,035,457	0.13
2019/20	17	1,490,040	0.11	246	20,051,345	0.12

#Rate per 10,000 bed-days

The data show a national and state downward trend in the rate of HA-BSI caused by MRSA.

b. Central line associated bloodstream infection (CLABSI)

South Australia began to formally collect ICU central line-day specific denominator data in mid-2012, allowing for more accurate reporting of ICU central line associated BSI rates. Table 11 includes data from nine South Australian hospitals with an adult ICU (AICU), compared to data supplied by Western Australia (WA)[7] and the national rate accessed via the Australian and New Zealand Intensive Care Society (ANZICS) CLABSI database.

Table 11: Number and rate of intensive care unit CLABSI line-days by jurisdiction and financial year, SA, 2013/14-2019/20

	SA				WA				ANZICS			
	Episodes	AICU line-days	Rate#	^CLUR	Episodes	AICU line-days	Rate#	^CLUR	Episodes	ICU line-days	Rate#	^CLUR
2013/14	17	25,623	0.66	65%	15	20,978	0.72	63%	131	218,835	0.60	n/a
2014/15	7	26,685	0.26	67%	7	19,566	0.36	49%	91	205,281	0.44	n/a
2015/16	11	28,191	0.39	67%	6	24,691	0.24	56%	92	206,028	0.45	n/a
2016/17	19	27,705	0.69	66%	3	25,643	0.12	56%	96	204,484	0.47	n/a
2017/18	13	28,540	0.46	68%	9	24,613	0.37	52%	100	213,362	0.47	n/a
2018/19	19	29,843	0.64	68%	13	26,953	0.48	57%	108	228,277	0.47	n/a
2019/20	16	28,211	0.57	71%	9	25,923	0.35	54%	105	226,442	0.46	n/a

#Rate per 1,000 line-days ^CLUR = central line utilisation ratio ($CLUR = 100 * \frac{AICU\ line-days}{AICU\ bed-days}$)

*ANZICS data includes paediatric intensive care unit data

Data are presented by financial year to align with the Western Australian and ANZICS reporting periods. The central line utilisation rate (CLUR) is a measure of the proportion of patient days in which central lines were used and provides an indication of patient acuity and clinical practices but not appropriateness of use.

The SA adult ICU CLABSI rate remains higher than both the ANZICS rate and the WA rate for 2019/20, noting that the SA CLUR is also higher than the CLUR reported by WA.

Acronymns

AICU	Adult intensive care unit
BSI	Bloodstream infection
CLABSI	Central-line associated BSI
CLUR	Central line utilisation rate
ESBL	Extended-spectrum beta-lactamase producing organisms
HA-BSI	Healthcare-associated bloodstream infection
ICP	Infection control professional
ICU	Intensive care unit
IP	Inpatient
IV	Intravenous
MRO	Multidrug-resistant organism
MRSA	Methicillin-resistant *Staphylococcus aureus*
MSSA	Methicillin-sensitive *Staphylococcus aureus*
NIP	Non-inpatient
SA	South Australia
SAB	*Staphylococcus aureus* bacteraemia
VRE	Vancomycin-resistant enterococci
WA	Western Australia

References

1. Australian Commission on Safety and Quality in Health Care. Data Set Specification Version 4.0. 2012.
2. SA Health Data and Reporting Services. ISAAC Refernece Manual. South Australian Admited Patient Activity Data Standards 2016.
3. Australian Institute of Health and Welfare. Australian hospital peer groups. Canberra: AIHW; 2015.
4. Australian Institute of Health and Welfare. National Healthcare Agreement: PB g–Better health services: the rate of Staphylococcus aureus (including MRSA) bacteraemia is no more than 1.0 per 10,000 occupied bed days for acute care public hospitals by 2020–21 in each state and territory, 2022. Metadata Online Registry (METeOR)2021.
5. Australian Institute of Health and Welfare. Bloodstream infections associated with hospital care 2019–20. Cat. no. HSE 240. Canberra: AIHW; 2021.
6. Australian Institute of Health and Welfare. Bloodstream infections associated with hospital care 2017–18: Australian hospital statistics. Canberra: AIHW; 2019.
7. Healthcare Infection Surveillance Western Australia. Personal Communication. Communicable Disease Control Directorate, WA Health; 2020

For more information

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