South Australian Department for Health and Wellbeing
Communicable Disease Control Branch
Infection Control Service

Healthcare-associated Infection (HAI) Surveillance Program

Healthcare-associated Bloodstream Infection (HA-BSI) Surveillance Annual Report

2022

16 MAY 2024

Government of South Australia
SA Health

South Australia Health

Infection Control Service Healthcare-associated Infection Surveillance Program
Healthcare-associated Bloodstream Infection (HA-BSI) Annual Report 2022

ABN 97643356590

ISSN: 2982-0685

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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 from contributing Local Health Networks (LHN). Minor discrepancies with previous reports may occur as data adjustments are made retrospectively.

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Introduction

South Australian (SA) Local Health Networks (LHN) are required to undertake healthcare-associated infection (HAI) surveillance as per the National Safety and Quality Health Service Standards[1]. There are both nationally and state required key performance indicators for HAI surveillance.

National HAI surveillance indicator requirements regarding the rate of healthcare-associated *Staphylococcus aureus* bloodstream infections (HA_SABSI) are as per the Australian Health Performance Framework and the National Healthcare Agreement (NHA). Nationally the target for HA-SABSI is ≤1.0 per 10,000 bed-days.

State-based indicators are outlined in the Performance Framework Master Document and are incorporated within the Local Health Network (LHN) Service Agreements. These are accompanied by the indicators featured in the Infection Control Service (ICS) Healthcare-associated infection (HAI) Surveillance Program. For a number of SA Health facilities, the target for HA-SABSI has been established at 0.7 per 10,000 bed-days, as stipulated in their respective Service Agreements. However, as this target is not applied statewide, the analysis presented in this report will focus on the National target.

The SA Health ICS HAI Surveillance Program provides a quality assured and consistent methodology to assist LHNs to undertake surveillance and reporting of this activity.

The ICS, Communicable Disease Control Branch (CDCB), of the Department for Health and Wellbeing coordinates the HAI surveillance program and centralised collection and reporting of HAI surveillance data for both national and state required indicators.

In conjunction with healthcare-associated bloodstream infections (HA-BSI), the ICS HAI Surveillance Program also collect data for other HAI indicators including targeted surgical site infections (SSI), *Clostridioides difficile* infection (CDI) and multidrug-resistant organisms (MRO), including methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *enterococci* (VRE) and multidrug-resistant Gram-negative (MRGN).

Continuous ongoing surveillance of bloodstream infections in hospitals is an important quality assurance and improvement activity, and the surveillance and reporting of healthcare-associated *Staphylococcus aureus* bloodstream infection (HA-SABSI) is a nationally required KPI for all SA Health hospitals. Surveillance and reporting contribute to safer care for patients, enables detection of cases as well as informing strategies for continuous improvement.

SA Health recognises that statewide health priorities incorporate partnerships with non-government and private sector stakeholders and promotes working together in the current SA Health and Wellbeing Strategy 2020-2025[2]. As patients move between public and private hospitals to undergo treatment in accordance with public-private partnerships, incorporating private facility HAI surveillance data into the SA HAI surveillance program assists with identifying potential differences in HAI incidence/morbidity rates and prompt collaborative discussions regarding practices across these sectors.

In conjunction with this HA-BSI annual surveillance report, HA-SABSI data is also reported via SA Health Quality, Information and Performance Hub (QIP HUB) for a sub-group of contributors, as well as SA HAI surveillance program benchmarking reports sent regularly to contributing hospital Infection Control Unit leads and Executives by the ICS.

HA-SABSI data for all South Australian facilities is provided annually to the Australian Institute of Health and Welfare (AIHW) as part of the national surveillance program and is published in the Report on Government Services (RoGS) reports as well as on the My Hospitals website.

For benchmarking purposes, public hospitals are grouped according to their size and acuity based on the current Australian Institute of Health and Welfare (AIHW) peer groups. Private hospitals are grouped separately. Refer to page 8 for applicable definitions.

Contributors are required to ensure they have internal procedures and activities that are undertaken in response to their internally generated surveillance activities and reports, in addition to HAI surveillance reports provided by the ICS.

This report focuses on the analysis of HA-BSI acquired by patients in South Australian metropolitan and rural hospitals (public and private) who contribute to the SA HAI surveillance program. The total number of contributors is 80, (SA Health metro=9, SA Health rural hospitals=62 and Private Hospitals=9) – for further detail refer to Table 1. Cumulative data gathered by the ICS as part of the SA Health Infection Control HAI Surveillance Program are presented as episodes and rates and update the previous report published in 2020.

Summary of Key Findings

Results – All organism surveillance

Contributors n=23: 8 public metropolitan, 6 public regional, 9 private

- There was a total of 738 HA-BSI recorded in 2022, compared to 757 in 2021. Of the 738 infections, 106 (14%) occurred in patients that were classified as “non-inpatient” at the time of diagnosis. Haematology/oncology patients made up 58% of non-inpatient episodes.
- The aggregate rate of HA-BSI for contributing hospitals decreased from 4.4 episodes per 10,000 bed-days in 2021 to 4.1 episodes per 10,000 bed-days in 2022.
- Intravenous (IV) line-associated infections were the most common primary focus of HA-BSI in 2022 (22% of all episodes); followed by the urinary tract at 21%.
- The overall rate of HA-BSI associated with the presence of an indwelling medical device was 1.07 per 10,000 bed-days in 2022.
    - 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 2022. The number of HA-BSI episodes due to central venous lines increased from 127 episodes in 2021 to 132 episodes in 2022.
- There were 124 cases of HA-BSI in intensive care unit (ICU) patients in 2022, representing a 23% increase from 95 cases in 2021. The aggregate rate of HA-BSI for all ICU patients increased from 18.5 per 10,000 bed-days in 2021 to 22.7 per 10,000 bed-days in 2022. Approximately 31% of ICU attributed episodes were associated with an IV line.
- The rate of all-cause HA-BSI for non-ICU patients decreased from 4.0 per 10,000 bed-days in 2021 to 3.5 per 10,000 bed-days in 2022.
- Forty four percent of HA-BSI with a multidrug resistant organism isolated were associated with Vancomycin-resistant enterococci (VRE), this is an increase of 10 cases from 21 episodes in 2021 to 31 episodes in 2022. Around 32% were associated with the haematology/oncology clinical unit.

Results – SABSI surveillance

Contributors n=80: 8 public metropolitan, 63 public regional, 9 private

The aggregate state HA-SABSI rate for 2022 of 0.50 per 10,000 bed-days remains below the nationally set target of less than 1.0 per 10,000 bed-days and has decreased from 0.60 per 10,000 bed-days in 2021. This reduction correlates to a decrease of 15 BSI episodes.

Methods

HA-BSI data are collected by the Infection Prevention and Control Units of participating hospitals in accordance with the agreed ICS HAI Surveillance Program statewide surveillance definitions. Current state definitions are available via the ICS website: http://www.sahealth.sa.gov.au/HAIsurveillance. Data are submitted monthly to the ICS and Rural Support Service (RSS) healthcare-associated surveillance programs, which undertake data quality checks prior to data being loaded to the state Infection Control Service Surveillance System (ICSSS) database.

Smaller regional facilities do not undertake *all organism* HA-BSI surveillance, focussing on HA-SABSI which is the minimum HA-BSI surveillance required as per national and state performance indicator requirements. These facilities are identified in the Participating hospitals table, refer table 1.

The SA Health ICS HAI Surveillance Program does not collect data from some facilities identified in the National Minimum Data Set as acute care facilities, however bed-days under surveillance for the state are consistently around 97% of all bed-days. Exclusions include but are not limited to, James Nash House, St Margarets hospital and the Pregnancy Advisory Service.

Numerator

The numerator includes all healthcare-associated positive blood cultures that occurred during the period of surveillance. Recurrent HA-BSI episodes with the same organism from the same source within 14 days of the original episode are excluded.

HA-BSI episodes are classified as either inpatient (IP) acquired or non-inpatient (NIP) acquired in accordance with the SA HA-BSI surveillance definitions.

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

Denominator

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%)[(3)].

- 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

[#]*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 at an approved hospital.*

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.

Attribution of probable source of HA-BSI

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

Surveillance definitions

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

Hospital type

Contributing hospitals are divided into categories based on a combination of the size and characteristics described by the AIHW Peer Groups[5].

Type 1 - Public acute group A and principal referral hospitals including specialist women's and children's hospitals

Type 2 - Public acute group B and 6 larger country hospitals from public acute group C which contribute directly to the SA Health HAI surveillance program via the ICS surveillance data collection process

Type 2s - Public acute group C hospitals which undertake surgical procedures

Type 3 - Rehabilitation, psychiatric and public acute group D hospitals

PRIV - Private contributors have been grouped together into the PRIV category

Participating hospitals

The SA Health ICS HAI Surveillance Program does not collect data from some facilities identified in the National Minimum Data Set as acute care facilities, however bed-days under surveillance for the state are consistently around 97% of all bed-days. Exclusions include but are not limited to, James Nash House, St Margarets hospital and the Pregnancy Advisory Service.

Participating hospitals both public and private, by hospital type are shown in Table 1. Smaller regional facilities provide data on HA-SABSI as a requirement of national and state Tier 1 reporting.

Table 1: Participating hospitals

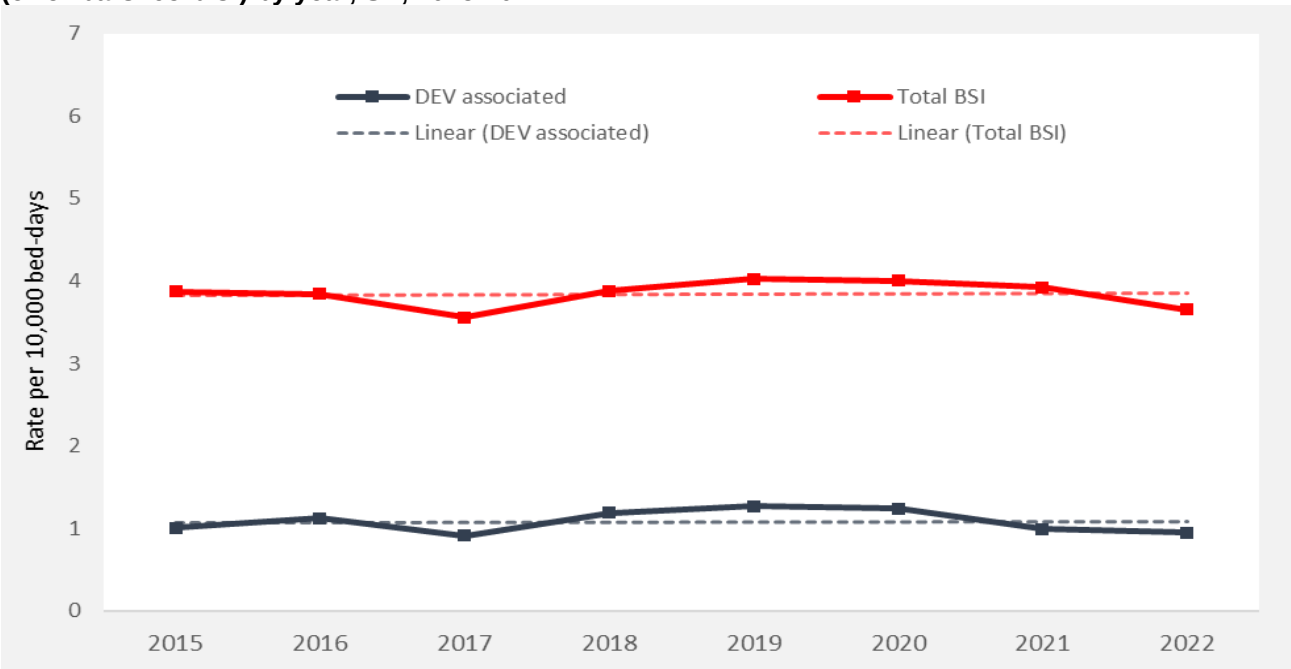
Hospital Type	Contributor Name	Data provision	Hospital Type	Contributor Name	Data provision
Type 1	Flinders Medical Centre	BSI	**Type 3**	Balaklava Soldier's Memorial District Hospital	SABSI
	Lyell McEwin Hospital	BSI		Barmera Hospital	SABSI
	Modbury Hospital	BSI		Booleroo Centre District Hospital and Health	SABSI
	Queen Elizabeth Hospital	BSI		Burra Hospital	SABSI
	Repatriation General Hospital	BSI		Central Yorke Peninsula Hospital (Maitland)	SABSI
	Royal Adelaide Hospital	BSI		Cleve District Health and Aged Care	SABSI
	Women's And Children's Hospital	BSI		Coober Pedy Hospital & Health Services	SABSI
Type 2	Berri Hospital	BSI		Cowell District Hospital	SABSI
	Mount Gambier Hospital	BSI		Cummins and District Memorial Hospital	SABSI
	Noarlunga Public Hospital	BSI		Elliston Hospital	SABSI
	Port Augusta Hospital	BSI		Eudunda Hospital	SABSI
	Port Lincoln Hospital	BSI		Glenside Hospital	SABSI
	Port Pirie Hospital	BSI		Gumeracha District Soldiers Memorial Hospital	SABSI
	Whyalla Hospital	BSI		Hampstead Rehabilitation Centre	SABSI
PRIV	Ashford Hospital	BSI		Hawker Memorial Hospital	SABSI
	Burnside Hospital	BSI		Karoonda & Districts Soldiers' Memorial Hospital	SABSI
	Calvary Adelaide Hospital	BSI		Kimba District Hospital and Aged Care	SABSI
	Calvary Hospital	BSI		Kingston Soldiers' Memorial Hospital	SABSI
	Flinders Private Hospital	BSI		Lameroo District Health Services	SABSI
	Memorial Hospital	BSI		Laura & Districts Hospital	SABSI
	North Eastern Hospital	BSI		Mannum District Hospital	SABSI
	St Andrew's Hospital	BSI		Meningie & Districts Memorial Hospital & Health	SABSI
	Western Hospital	BSI		Mount Pleasant District Hospital	SABSI
Type 2s	Angaston District Hospital	SABSI		Orroroo & District Health Service	SABSI
	Bordertown Memorial Hospital	SABSI		Penola War Memorial Hospital	SABSI
	Ceduna District Health Service	SABSI		Peterborough Soldiers' Memorial Hospital	SABSI
	Clare Hospital	SABSI		Pinnaroo Soldiers' Memorial Hospital	SABSI
	Crystal Brook and District Hospital	SABSI		Port Broughton District Hospital & Health Services	SABSI
	Gawler Health Service	SABSI		Riverton District Soldiers' Memorial Hospital	SABSI
	Jamestown Hospital & Health Service	SABSI		Roxby Downs Health Services	SABSI
	Kangaroo Island Health Service	SABSI		Snowtown Hospital	SABSI
	Kapunda Hospital	SABSI		Southern Yorke Peninsula Health (Yorketown)	SABSI
	Loxton Hospital Complex	SABSI		Streaky Bay Hospital	SABSI
	Millicent & District Hospital & Health Services	SABSI		Tailem Bend District Hospital	SABSI
	Mount Barker District Soldiers' Memorial Hospital	SABSI		Tumby Bay Hospital and Health Services	SABSI
	Murray Bridge Soldiers' Memorial Hospital	SABSI		Wudinna Hospital	SABSI
	Naracoorte Health Service	SABSI			
	Northern Yorke Peninsula Health Service (Wallaroo)	SABSI			
	Renmark Paringa District Hospital	SABSI			
	South Coast District Hospital	SABSI			
	Strathalbyn and District Health Service	SABSI			
	Tanunda War Memorial Hospital	SABSI			
	Waikerie Hospital & Health Services	SABSI			

Results – All organism surveillance (contributors n=23)

1. Overall trend in Healthcare-associated bloodstream infection rates

The total HA-BSI rate decreased slightly from 4.4 per 10,000 bed-days in 2021 to 4.1 per 10,000 bed-days in 2022 while the indwelling medical device-associated HA-BSI rate remained stable at 1.1 per 10,000 bed-days in 2022. Further analysis on primary source/focus can be found in section 3.

Figure 1: Aggregate annual HA-BSI rates for all contributing hospitals, total and device-associated (error bars: 95% CI) by year, SA, 2015-2022



*DEV = indwelling medical device

Table 2 shows overall and device-associated HA-BSI episodes and rates by hospital type. For type 1 hospitals the rate of overall HA-BSI has decreased from 5.4 per 10,000 bed-days in 2021 to 4.9 per 10,000 bed-days in 2022, type 2 facilities also showed a decrease in 2022 with 0.8 per 10,000 bed-days down from 1.5 per 10,000 bed-days in 2021. Private hospitals (PRIV) increased slightly in the overall HA-BSI rates for 2022 compared to 2021.

Table 2: Rate and number of total and device-associated HA-BSI by hospital type and year, SA, 2020-2022

	Hospital Type	2020			2021			2022		
		Episodes	Bed-days	Rate*	Episodes	Bed-days	Rate*	Episodes	Bed-days	Rate*
Overall BSI	Type 1	573	1086284	5.27	623	1143559	5.45	603	1228982	4.91
	Type 2	30	146428	2.05	23	157556	1.46	13	160993	0.81
	PRIV	129	382404	3.37	111	403148	2.75	122	403512	3.02
	Total BSI	**732**	**1615116**	**4.53**	**757**	**1704263**	**4.44**	**738**	**1793487**	**4.11**
Device associated BSI	Type 1	172	1086284	1.58	142	1143559	1.24	149	1228982	1.21
	Type 2	5	146428	0.34	5	157556	0.32	3	160993	0.19
	PRIV	48	382404	1.26	44	403148	1.09	40	403512	0.99
	Total Device	**225**	**1615116**	**1.39**	**191**	**1704263**	**1.12**	**192**	**1793487**	**1.07**

*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 HA-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. Healthcare-associated bloodstream infections by patient admission 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 2015 to 2022. Approximately 15% of all episodes in 2022 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, 2015-2022

Year	No. of BSI episodes			Percentage
	Inpatient (IP)	Non-inpatient (NIP)	Total	Non-inpatient (NIP)
2015	594	144	738	19.5%
2016	625	100	725	13.8%
2017	582	106	688	15.4%
2018	648	101	749	13.5%
2019	633	139	772	18.0%
2020	621	111	732	15.2%
2021	648	109	757	14.4%
2022	632	106	738	14.4%

In 2022, the majority of IP episodes have occurred in patients admitted under surgical units (31%) followed by haematology/oncology (17%) and general medicine (26%), while many NIP episodes over this time period have occurred in haematology/oncology patients (58%) and surgical patients (32%).

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, 2020-2022

Clinical Unit	2020			2021			2022		
	Episodes	Bed-days	Rate#	Episodes	Bed-days	Rate#	Episodes	Bed-days	Rate#
Cardiac surgery	8	27565	2.90	10	21621	4.63	16	34411	4.65
Cardiology	30	69565	4.31	22	66221	3.32	19	59207	3.21
Gastroenterology	28	33190	8.44	31	37923	8.17	27	42502	6.35
General medicine	144	420211	3.43	149	433319	3.44	165	492571	3.35
General surgery	113	150157	7.53	134	152125	8.81	123	140456	8.76
Gynae/Obstetrics	10	93851	1.07	8	95300	0.84	15	91521	1.64
Haematology/oncology	220	76254	28.85	210	77713	27.02	171	78689	21.73
Neonatology	17	45729	3.72	17	43321	3.92	7	38745	1.81
Nephrology	28	96262	2.91	14	99846	1.40	31	105378	2.94
Neurosurgery	13	26809	4.85	12	25578	4.69	11	25463	4.32
Orthopaedic	24	112401	2.14	20	121050	1.65	24	119093	2.02
Other	30	246432	1.22	50	258637	1.93	58	270063	2.15
Other surgical specialties	56	109231	5.13	72	121840	5.91	56	119794	4.67
Paediatric medicine	0	16609	0.00	0	18338	0.00	0	17483	0.00
Paediatric surgery	3	5488	5.47	0	5419	0.00	2	6033	3.32
Unassigned	0	87499	0.00	0	101690	0.00	1	127856	0.08
Vascular	8	21221	3.77	8	24322	3.29	12	24222	4.95

Rate per 10,000 bed-days **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

While there was variation in HA-BSI rates for many specialties in 2022 compared to 2021, only three specialties had significant increases. Of note:

- the HA-BSI rate associated with the Gynae/Obstetrics clinical unit increased from 0.84 per 10,000 bed-days in 2021 to 1.64 per 10,000 bed-days in 2022,
- the rate of HA-BSI in nephrology patients increased from 1.4 per 10,000 bed-days in 2021 to 2.94 per 10,000 bed-days in 2022 and
- the HA-BSI rate for the vascular clinical unit increased from 3.29 per 10,000 bed-days in 2021 to 4.95 per 10,000 bed-days in 2022.

During the same period, the Neonatology clinical unit had a substantial reduction in the HA-BSI rate, from 3.92 per 10,000 bed-days in 2021 to 1.81 per 10,000 bed-days in 2022 representing a reduction of 10 BSI episodes from 17 in 2021 to 7 in 2022.

a. Intensive Care Unit (ICU) associated HA-BSI episodes

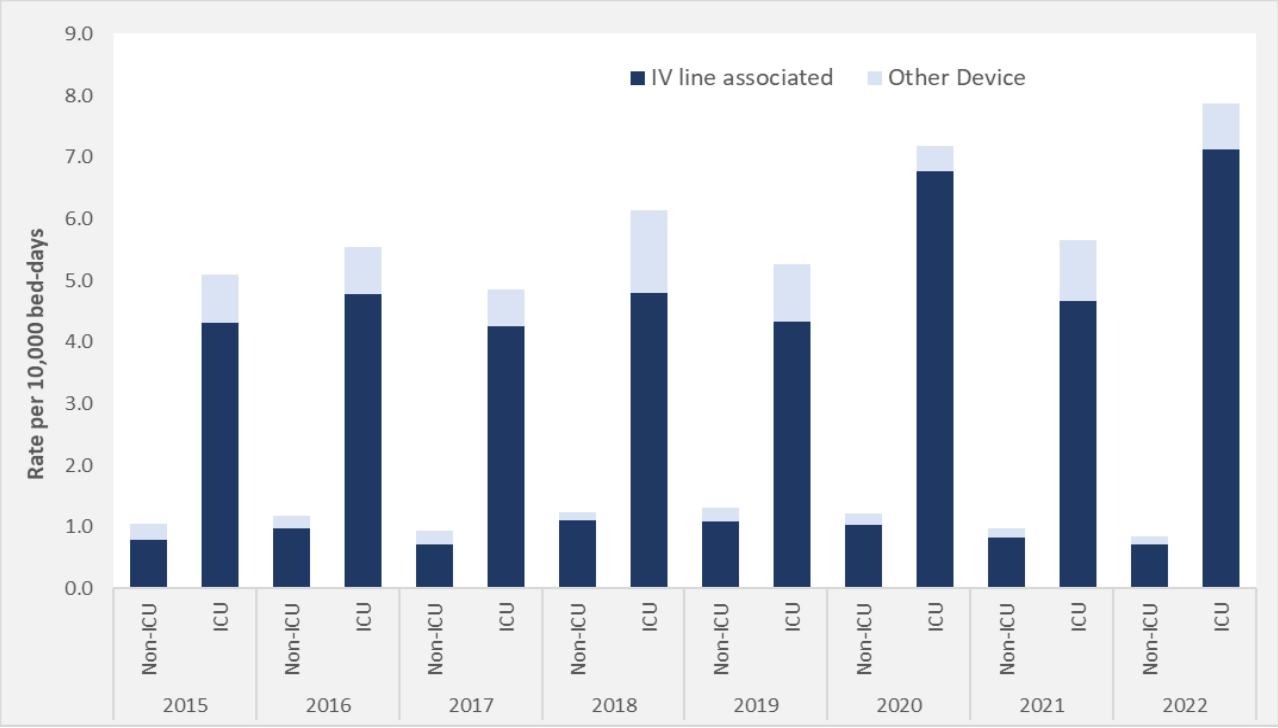
The risk of HA-BSI is inherently higher in critically ill patients due to underlying co-morbidities and more invasive medical procedures, and analysis by ICU status (includes adult, paediatric and neonatal) demonstrates this increased risk.

There were 124 cases of HA-BSI in ICU patients in 2022, representing a 23% increase from 95 cases in 2021. The aggregate rate of HA-BSI for all ICU patients increased from 18.5 per 10,000 bed-days in 2021 to 22.7 per 10,000 bed-days in 2022, while the corresponding rate of HA-BSI for non-ICU patients decreased from 4.0 per 10,000 bed-days in 2021 to 3.5 per 10,000 bed-days in 2022.

Indwelling medical devices were deemed responsible for approximately 35% of all ICU associated episodes in 2022. Of the 112 ICU associated episodes in 2022 where a specific primary focus could be identified, IV lines were the most frequently identified source accounting for the largest proportion of episodes (31%), followed by the respiratory tract (16%), the urinary tract (11%) and the gastrointestinal tract (10%). The proportion of ICU associated episodes where the source was unknown or recorded as disseminated has decreased from 16% in 2015 to 10% in 2022.

Figure 2 shows a breakdown of medical device associated BSI episodes according to patient location since 2015.

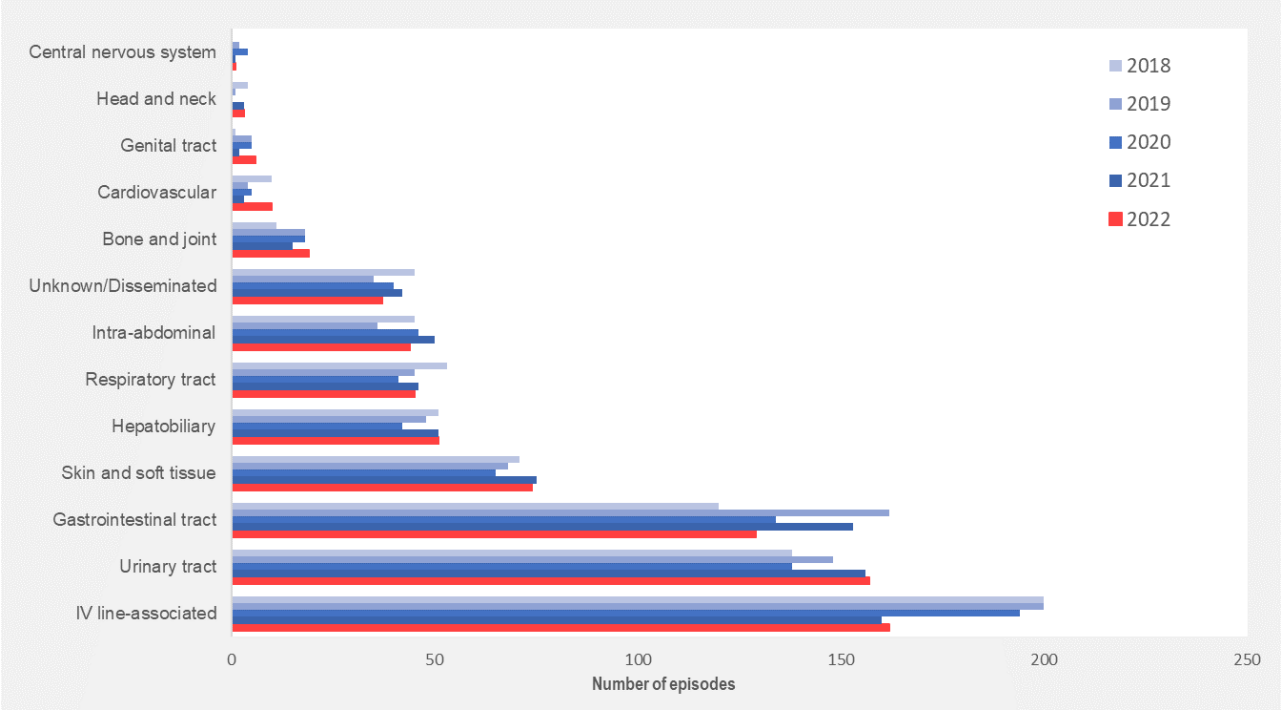
Figure 2: Rate of device-associated bloodstream infection episodes according to ICU status, by device type and year, SA, 2015-2022



3. Analysis by Primary Focus/Source

Establishing a likely infection focus or primary source of HA-BSI can 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, 2018-2022



For 2022 the most common primary focus was IV lines, accounting for 22% of all HA-BSI episodes. The number of HA-BSI episodes attributed to an IV line remained relatively stable at 162 episodes in 2022. 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 2022 was the urinary tract (21%) followed by the gastrointestinal tract at 17%. More than half of the episodes associated with the gastrointestinal tract as the primary focus, occurred in haematology/oncology (adult and paediatric) patients (56%), most likely due to the presence of mucositis secondary to chemotherapy.

Five percent (n=37) of HA-BSI episodes were reported as having a primary focus which could not be determined. Forty-two percent of these episodes were attributable to general medicine patients, while a further 11% occurred in haematology/oncology patients.

Table 5 shows a further breakdown of all HA-BSI episodes in 2022 compared to 2021 by patient age category, device-associated and procedure-associated sources. The data show the decrease in HA-BSI episodes in 2022 have been largely due to decreases in procedure-associated episodes from 139 episodes in 2021 to 125 episodes in 2022.

Table 5: Bloodstream infections by patient age group, source category and year, SA, 2021-2022

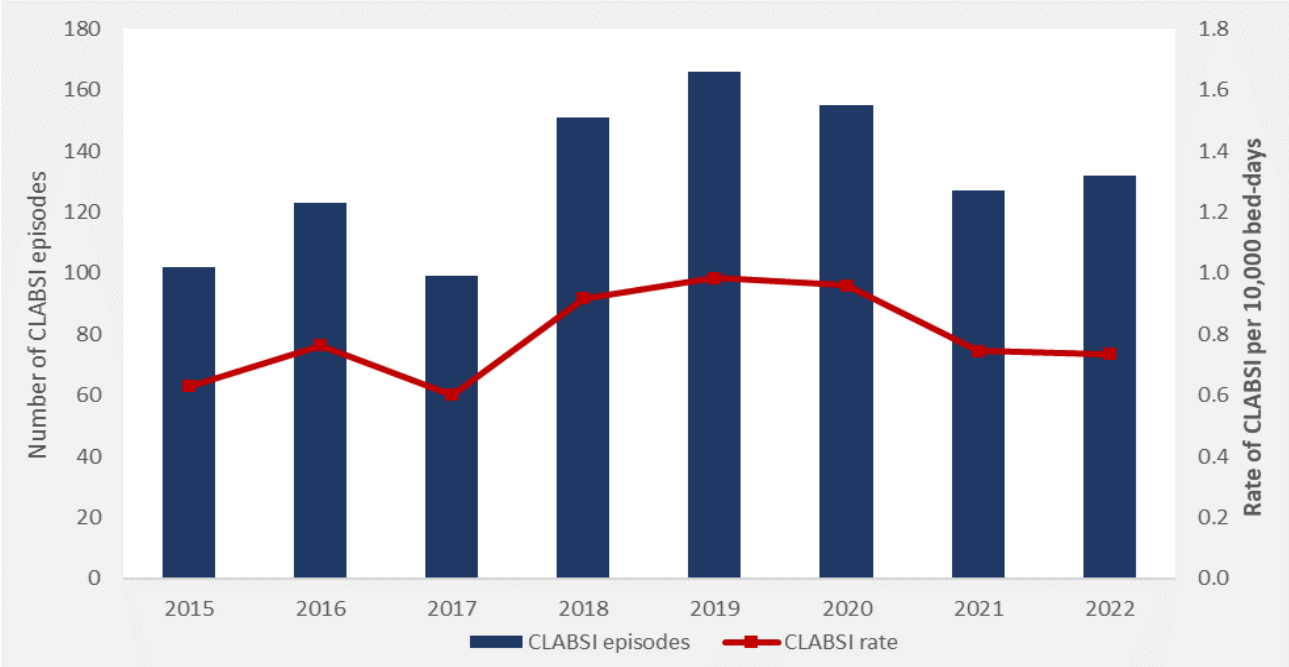
Source category	No. of eopisodes (% of total) 2021				No. of eopisodes (% of total) 2022			
	Adults	Children	Neonates	TOTAL	Adults	Children	Neonates	TOTAL
Device associated:								
Central line	121	0	6	**127**	127	4	1	**132**
Peripheral line	27	0	1	**28**	27	0	2	**29**
Other IV access	5	0	0	**5**	1	0	0	**1**
Other Device	9	0	0	**9**	10	0	0	**10**
Urinary catheter	22	0	0	**22**	20	0	0	**20**
Total device associated	**184 (25%)**	**0 (0%)**	**7 (41%)**	**191 (25%)**	**185 (25%)**	**4 (80%)**	**3 (43%)**	**192 (26%)**
Procedure associated	138	0	1	**139**	124	0	1	**125**
Non-device/Non-procedure	417	1	9	**427**	417	1	3	**421**
Total	**739**	**1**	**17**	**757**	**726**	**5**	**7**	**738**

"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 healthcare-associated bloodstream infections

Device-associated HA-BSI episodes continue to account for a considerable proportion of all HA-BSI events (26% of the total in 2022); 84% of these were associated with IV lines. Central venous lines accounted for approximately 69% of all device-associated episodes in 2022. Figure 4 shows the trend in hospital wide central line-associated BSI since 2015.

Figure 4: Number and rate of central line-associated bloodstream infection (CLABSI) cases by year, SA, 2015-2022



The number of CLABSI episodes increased from 127 episodes in 2021 to 131 episodes in 2022, this remains well below the high of 166 episodes in 2019. PICC accounted for 50% of all CLABSI episodes and were predominantly associated with the adult haematology/oncology specialty.

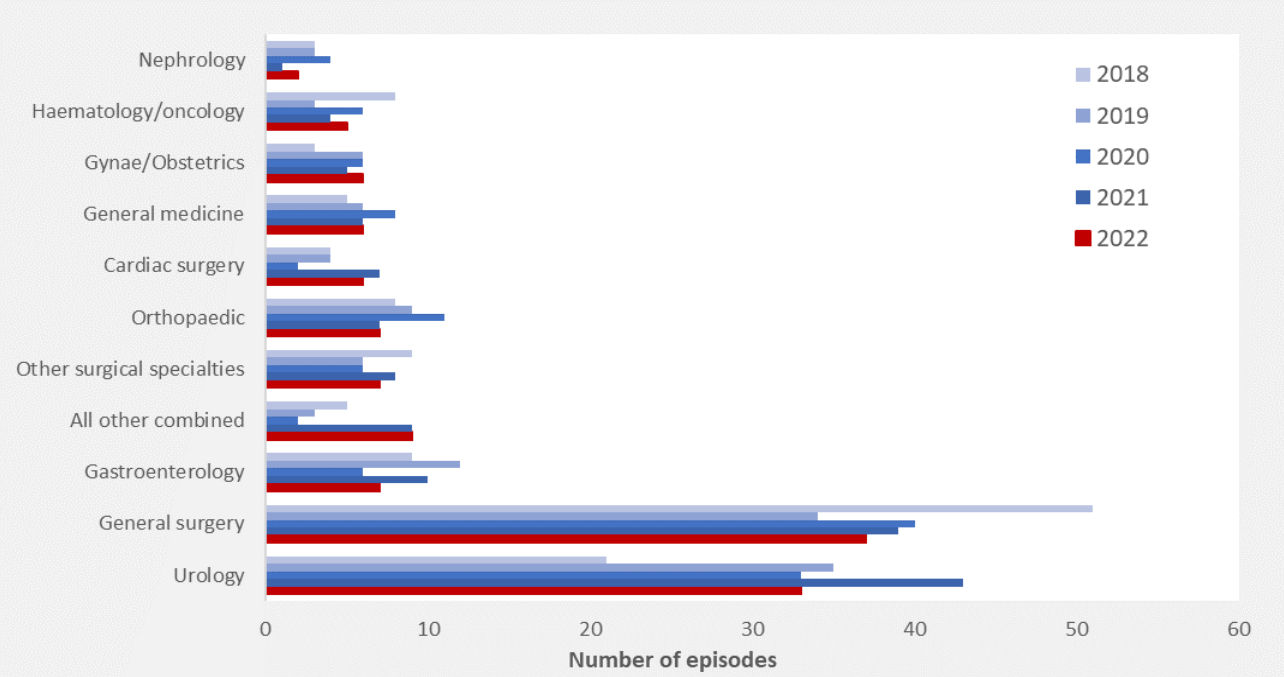
b. Other device-associated bloodstream infections

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 22 episodes in 2021 to 20 episodes in 2022, as well as a negligible increase in episodes associated with other types of indwelling medical device, such as endotracheal tubes, shunts, stents, cardiac valves and pacemakers, from 9 episodes in 2021 to 10 episodes in 2022.

c. Procedure associated bloodstream infections

Figure 5 shows the number of procedure associated HA-BSI episodes by clinical specialty for the years 2018-2022.

Figure 5: Procedure associated HA-BSI by specialty group by year, SA, 2018-2022



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

The highest number of procedure-associated HA-BSI episodes occurred in general surgery patients accounting for 30% of procedure-associated HA-BSI during 2022. 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 HA-BSI episodes in 2022; this reflects a decrease in procedure associated episodes in urology patients from 43 episodes in 2021 compared to 33 episodes in 2022.

4. Analysis by Organism

a. Healthcare-associated bloodstream infection causative organisms

Table 6 shows the distribution of microorganisms responsible for HA-BSI from 2015 to 2022.

Table 6: HA-BSI by organism type isolated from blood by year, SA, 2015-2022

Organism group	No. of episodes							
	2015	2016	2017	2018	2019	2020	2021	2022
Total Gram positives	**261**	**272**	**249**	**266**	**277**	**265**	**243**	**238**
Staphylococcus aureus (methicillin R)	18	27	20	23	18	14	19	12
Staphylococcus aureus (methicillin S)	101	106	102	92	91	106	88	82
coagulase negative staphylococci	34	43	45	65	69	68	42	46
Enterococcus spp. (Vancomycin R)	16	16	27	13	16	3	16	26
Enterococcus spp. (Vancomycin S)	54	50	39	55	56	51	53	52
Streptococcus spp.	38	30	16	18	27	23	25	20
Total Gram negatives	**294**	**313**	**291**	**297**	**305**	**307**	**315**	**306**
Escherichia spp.	111	125	115	118	134	107	122	125
Pseudomonas aeruginosa	49	56	51	45	43	39	46	44
Klebsiella spp.	54	51	52	46	45	60	66	62
Enterobacter spp.	31	31	32	34	28	30	29	26
Proteus group	15	12	8	9	12	12	12	11
GNB other	34	38	33	45	43	59	40	38
Total other	**75**	**80**	**77**	**116**	**101**	**86**	**119**	**123**
Anaerobe	27	24	24	26	22	23	32	25
Candida/yeast	32	40	40	74	53	53	65	72
miscellaneous other	16	16	13	16	26	10	22	26
Polymicrobial*	**108**	**60**	**71**	**70**	**89**	**74**	**80**	**71**
Total	**738**	**725**	**688**	**749**	**772**	**732**	**757**	**738**

* Polymicrobial includes all episodes where more than one significant organism is isolated within a 48hr period.
GNB = Gram negative bacilli

S. aureus remains a key causative organism of HA-BSI, responsible for approximately 14% of all episodes (including polymicrobial episodes where *S. aureus* was one of the organisms isolated). Thirteen percent of all *S. aureus* HA-BSIs in 2022 were acquired in NIP settings. The proportion of *S. aureus* BSIs (HA-SABSI) caused by methicillin-resistant strains (MRSA) was 14% in 2022 (see HA-SABSI surveillance section for further analysis and inclusion of additional SA healthcare facilities who undertake targeted HA-SABSI surveillance).

Escherichia coli (*E. coli*) also remain a major causative organism for HA-BSI, responsible for approximately 19% of episodes (including polymicrobial episodes where *E. coli* was one of the organisms isolated). The main sources of these episodes were the urinary tract (41%); the gastrointestinal tract (24%) and hepatobiliary primary focus (12%).

The proportion of HA-BSIs classified as polymicrobial has remained stable at 10% in 2022. Of the 71 polymicrobial episodes in 2022, 6 included *S. aureus* as one of the bacteria isolated, and 12 included *E. coli*. The most frequently identified foci of polymicrobial episodes were IV lines (38%), followed by the gastrointestinal tract (14%), skin and soft tissue (11%) and the urinary tract (10%). Polymicrobial episodes were associated with neutropenia in 20% of cases.

Yeast isolates have continued to increase and now account for approximately 10% of HA-BSI. The most frequently identified foci in this group was the urinary tract (31%) and IV line-associated episodes (30%).

b. Multidrug-resistant organisms HA-BSI, excluding MRSA

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

Table 7: Episodes of HA-BSI due to multidrug-resistant organisms other than MRSA by year, SA, 2015-2022

Resistance category	2015	2016	2017	2018	2019	2020	2021	2022
Plasmid-mediated AmpC beta-lactamase producers (AMPC)	6	8	4	7	4	4	5	8
Carbapenem-resistant Gram negative bacillis (CRGNB)*	1	1	1	0	1	0	0	1
Extended spectrum beta-lactamase producers (ESBL)	26	12	21	20	32	15	29	25
Multi-resistant Pseudomonas aureginosa (MRPAER)*	6	3	7	7	4	2	1	5
Vancomycin-resistant enterococci (VRE)	28	21	32	18	17	4	21	31
Grand Total	**67**	**45**	**65**	**52**	**58**	**25**	**56**	**70**

*includes carbapenemase-producing organisms

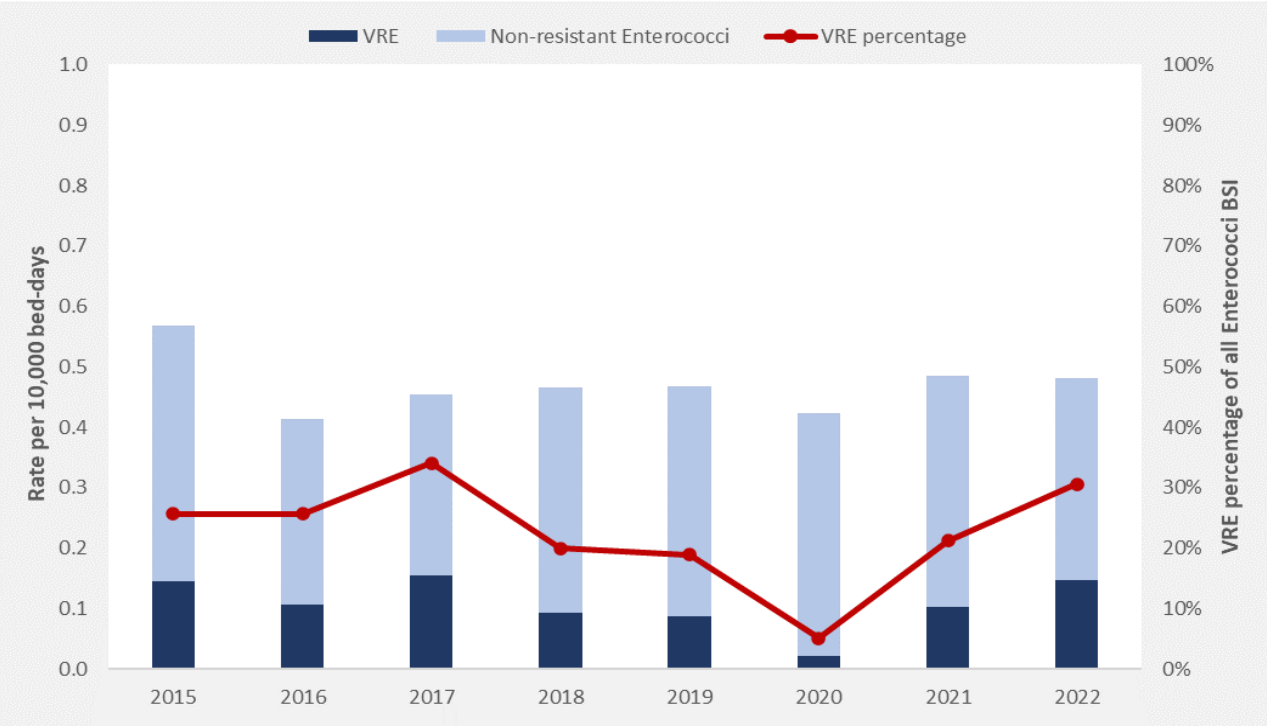
NOTE: this dataset includes polymicrobial episodes where the MRO was one of the isolates; cases may be counted more than once in aggregate MRO counts if the BSI had more than one MRO type.

The rate of HA-BSI due to Vancomycin resistant enterococci (VRE) increased from 0.10 per 10,000 bed-days in 2021 to 0.15 per 10,000 bed-days in 2022, with the proportion of vancomycin-resistance in all enterococci HA-BSI increasing from 21% in 2021 to 31% in 2022. Refer to Figure 6.

VRE HA-BSI have occurred predominantly in patients admitted under haematology/oncology (32%), followed by general surgical units (26%).

ESBL producers continue to be a large proportion of HA-BSI due to MROs other than MRSA, at 36%, representing a notable decrease from 52% in 2021, however due to the overall increase in MROs over that time, this only represents a decrease of 4 cases. ESBL detection has been mainly seen amongst *E. coli* (15 out of 25 in 2022), all of which 81% occurred in non-ICU patients. The primary source of infection for HA-BSI caused by ESBL producers in 2022 was the urinary tract with eleven episodes.

Figure 6: Rate of enterococcal HA-BSI and percentage of VRE HA-BSI by year, SA, 2015-2022



The increasing trend since 2020, likely represents a return to pre-COVID19 pandemic levels as hospital activities reset.

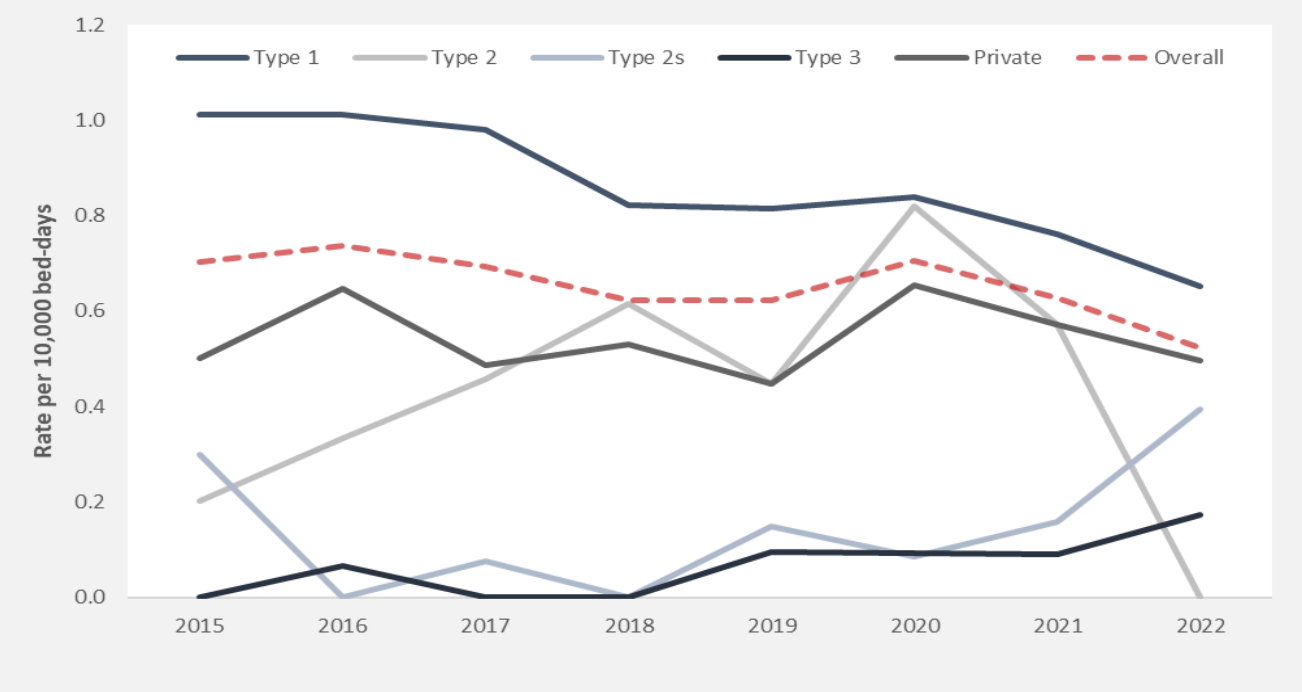
Results – HA-SABSI surveillance (contributors n=80)

All acute care facilities within SA are required to undertake HA-SABSI surveillance as part of the Australian Health Performance Framework. Results included in this section are comprised of data from 80 private and public hospital contributors and documented figures will not correlate to HA-SABSI analysis figures in the previous **All Organism** bloodstream infection surveillance section which includes data from 23 public and private contributors.

a. Healthcare-associated *Staphylococcus aureus* bloodstream infection

HA-SABSI 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[6]. Figure 7 shows the trend in HA-SABSI rates for South Australian hospitals stratified by hospital type.

Figure 7: Rate of HA-SABSI by hospital peer group and year, SA, 2015-2022



The aggregate state HA-SABSI rate for 2022 of 0.50 per 10,000 bed-days remains below the nationally set target of less than 1.0 per 10,000 bed-days and has decreased from 0.60 per 10,000 bed-days in 2021. This reduction correlates to a decrease of 15 BSI episodes.

Table 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

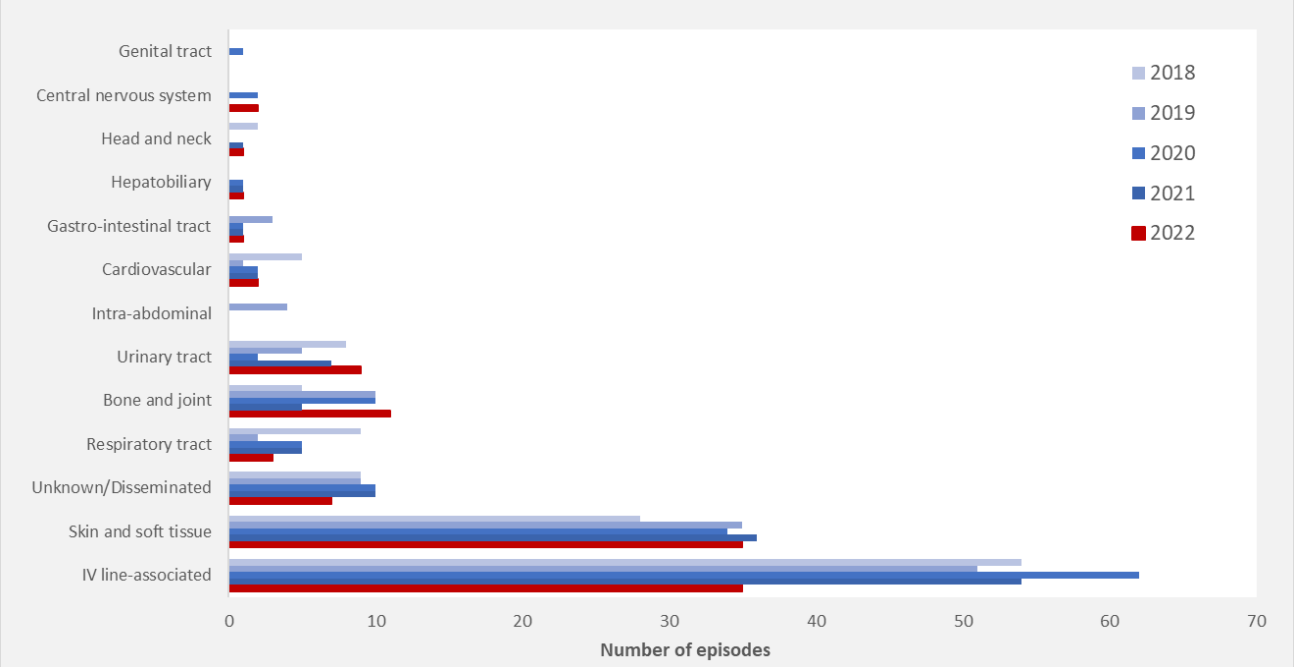
Table 8: HA-SABSI cases and rates by hospital peer group and year, SA, 2018-2022

Hospital	2018			2019			2020			2021			2022		
Type	Episodes	Bed-days	Rate*	Episodes	Bed-days	Rate*	Episodes	Bed-days	Rate*	Episodes	Bed-days	Rate*	Episodes	Bed-days	Rate*
Type 1	89	1084388	0.8	92	1128773	0.8	91	1086284	0.8	87	1143559	0.8	80	1228982	0.7
Type 2	10	162789	0.6	7	156464	0.4	12	146428	0.8	9	157556	0.6	0	160993	0.0
Type 2s	0	137185	0.0	2	134402	0.1	1	116020	0.1	2	126074	0.2	5	126909	0.4
Type 3	0	149118	0.0	1	104349	0.1	1	109304	0.1	1	110449	0.1	2	115330	0.2
PRIV	21	396878	0.5	18	402693	0.4	25	382404	0.7	23	403148	0.6	20	403512	0.5
Total	**120**	**1930358**	**0.6**	**120**	**1926681**	**0.6**	**130**	**1840440**	**0.7**	**122**	**1940786**	**0.6**	**107**	**2035726**	**0.5**

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

Figure 8 shows a breakdown of HA-SABSI episodes by primary focus of infection, for the years 2018 - 2022.

Figure 8: Healthcare-associated *S. aureus* bacteraemia by primary focus and year, SA, 2018-2022



*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 8, HA-SABSI episodes associated with IV lines has decreased from 55 episodes in 2021 to 36 episodes in 2022, this represents 34% of all SABSI episodes and are considered potentially preventable.

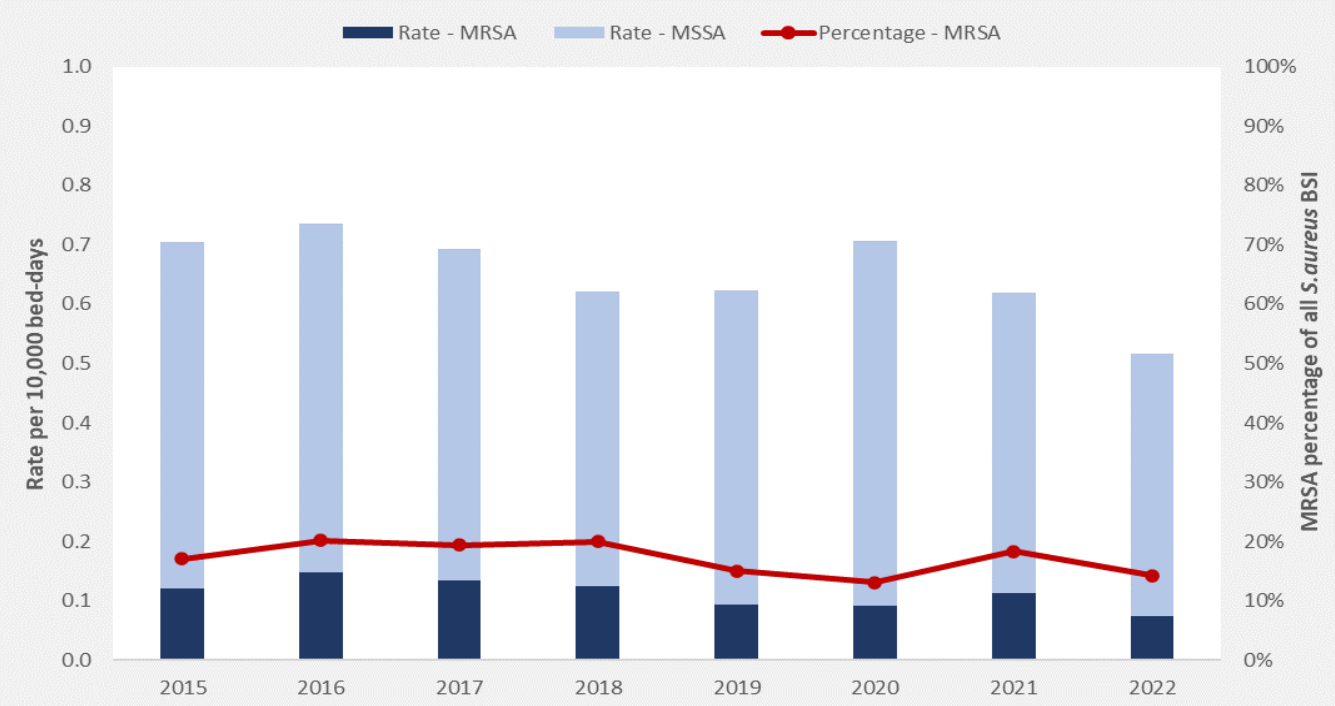
Skin and soft tissue associated HA-BSI episodes also continue to be a large focus of HA-SABSI, the second most common (33%) primary focus for HA-SABSI.

Seven percent of all HA-SABSI episodes in 2022 did not have a primary focus identified.

b. Healthcare-associated Methicillin-resistant *Staphylococcus aureus* bloodstream infection

Figure 9 shows the rate of HA-SABSI per 10,000 bed-days since 2015, stratified by methicillin sensitivity (MSSA) or resistance (MRSA), and shows the percentage of all HA-SABSI which are due to MRSA.

Figure 9: Healthcare-associated *S. aureus* bloodstream infection rates by methicillin sensitivity or resistance and the percentage of methicillin-resistant HA-SABSI, by year, SA, 2015-2022



The rate of MRSA HA-BSI has decreased from 0.11 per 10,000 bed-days in 2021 to 0.07 per 10,000 bed-days in 2022, along with the rate of HA-BSI due to MSSA which decreased from 0.61 per 10,000 bed-days in 2021 to 0.50 per 10,000 bed-days in 2022. The proportion of SABSI that were caused by MRSA decreased from 18% in 2021 to 14% in 2022.

The rate of MRSA HA-SABSI 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 HA-SABSI 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 0.17 per 10,000 bed-days in 2021 to 0.09 per 10,000 bed-days in 2022, while type 3 and private hospitals have shown increases from 0.00 per 10,000 bed-days to 0.08 per 10,000 bed-days and 0.00 per 10,000 bed-days to 0.07 per 10,000 bed-days, respectively.

No MRSA HA-SABSI were identified in intensive care units for 2022.

5. Benchmarking

6. Healthcare-associated *Staphylococcus aureus* bloodstream infection

HA-SABSI 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 7 presents data for each jurisdiction as submitted to the AIHW for the financial year 2021-2022[7].

Table 7: Number and rate of SABSI for public hospitals by state, July 2021 to June 2022

State	Episodes	Denominator	Total SAB rate per 10,000 bed-days
Australian Capital Territory	45	417,342	1.08
New South Wales	566	6,965,209	0.81
Northern Territory	27	386,530	0.70
Queensland	304	4,475,655	0.68
South Australia	97	**1,561,337**	**0.62**
Tasmania	48	509,805	0.94
Victoria	332	5,148,824	0.64
Western Australia	127	1,585,435	0.80
Australia	**1546**	**21,050,137**	**0.73**

Table 9 shows that for the financial year 2021-2022, SA had the lowest jurisdictional HA-SABSI rate at 0.62 per 10,000 bed-days and remains below the target of 1.0 per 10,000 bed-days.

Table 8 provides a comparison of annual MRSA HA-BSI rates between South Australia (SA), and Australia (AIHW)[8].

Table 8: Number and rate of MRSA HA-BSI for public hospitals for South Australia and Australia by financial year, 2015/16-2021/22

	SA			National		
	Episodes	Bed-days (BD)	Rate#	Episodes	Bed-days (BD)	Rate#
2015/16	16	1,554,292	0.10	278	19,608,100	0.14
2016/17	25	1,558,758	0.16	290	19,833,800	0.15
2017/18	24	1,561,621	0.15	267	20,453,200	0.13
2018/19	21	1,563,879	0.13	277	21,035,457	0.13
2019/20	17	1,533,765	0.11	246	20,051,345	0.12
2020/21	15	1,539,759	0.10	263	20,705,514	0.13
2021/22	21	1,592,096	0.13	238	21,050,137	0.11

#Rate per 10,000 bed-days

In contrast to the overall SA HA-SABSI rate, the SA MRSA HA-BSI rate has increased for the 2021/22 financial year from 0.10 per 10,000 bed-days to 0.13 per 10,000 bed-days, this increase is equivalent to an additional 6 MRSA BSI episodes.

a. 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 9 includes data from nine SA hospitals with an adult ICU (AICU), compared to data supplied by Western Australia (WA) and the national rate accessed via the Australian and New Zealand Intensive Care Society (ANZICS) CLABSI database.

Table 9: Number and rate of intensive care unit CLABSI line-days by jurisdiction and financial year, SA, 2015/16-2021/22

	SA				WA				ANZICS			
	Episodes	AICU line-	Rate#	^CLUR	Episodes	AICU line-days	Rate#	^CLUR	Episodes	ICU line-days	Rate#	^CLUR
2015/16	11	25,157	0.44	60%	6	24,691	0.24	56%	131	218,835	0.60	n/a
2016/17	18	25,760	0.70	61%	3	25,643	0.12	56%	91	205,281	0.44	n/a
2017/18	13	27,855	0.47	66%	9	24,613	0.37	52%	92	206,028	0.45	n/a
2018/19	19	29,261	0.65	65%	13	26,973	0.48	57%	96	204,484	0.47	n/a
2019/20	16	27,917	0.57	70%	9	25,923	0.35	54%	100	213,362	0.47	n/a
2020/21	19	26,868	0.71	66%	10	28,294	0.35	56%	108	228,277	0.47	n/a
2021/22	17	27,644	0.61	67%	12	29,701	0.40	59%	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 2021/22, noting that the SA CLUR is also higher than the CLUR reported by WA.

Conclusion

Since the previously published HA-BSI annual report, there has been a notable shift in the overall rate of all cause/organism HA-BSI. The recent data suggest an improvement in the rate of HA-BSI, primarily attributed to a decrease in episodes related to non-intensive care unit (non-ICU) patient care. Specifically, the reduction in HA-BSI episodes associated with the gastrointestinal tract, which showed a 16% decrease since 2021, has contributed to this positive trend, with 51% of these episodes linked to Haematology/Oncology patients.

However, a concerning trend has emerged, indicating a worsening overall rate of VRE HA-BSI. In 2022, VRE HA-BSI episodes showed a 55% increase, particularly in immunocompromised haematology/oncology patients and surgical patients. Refer to Table 7.

Analysis of the data reveals a trending toward Gram-negative HA-BSI over the reporting period, with potential implications for antimicrobial treatment advice. ESBL-producing Gram-negative organisms continue to be a prominent cause of multi-resistant HA-BSI, with a notable association with urological procedures.

Although the data in this report indicates SA contributor data are under the national and state KPI thresholds, HA-SABSI remain a significant concern, with this type of infection having a reported mortality rate of around 20%[9-11]. In 2022, *S. aureus* was responsible for 14% of total HA-BSI episodes, with 34% being associated with IV-line use and considered potentially preventable. While the aggregate rate of HA-SABSI decreased from 2021 to 2022 (Refer to Figure 7), ongoing efforts are required to further reduce this important cause of patient morbidity and mortality, in particular for intravenous line (IV-line) use and management.

The proportion of HA-SABSI due to methicillin-resistant strains (MRSA) is a crucial indicator of infection prevention success associated with antimicrobial stewardship. While the aggregate MRSA bloodstream infection rate in SA has decreased in 2022, it remains slightly above the national rate as reported by the AIHW. Continued surveillance and targeted infection control quality improvement initiatives and efforts, including antimicrobial stewardship, are warranted.

Higher rates of adult ICU-associated central line utilisation and CLABSI persist in SA when compared to Western Australia and peer ANZICS contributors, necessitating continued attention and noting by contributors. In some other regions of the world, epidemiological data on BSI pathogens and their antimicrobial resistance profiles are published at regular intervals, these include (but are not limited to) groups such as European Antimicrobial Resistance Surveillance Network (EARS-Net), the Centers for Disease Control and Prevention (CDC) and the United Kingdom Health Security Agency. Similarly, in Australia, the Australian Group on Antimicrobial Resistance (AGAR) has taken the lead in reporting the epidemiology of specific BSI pathogens such as *S. aureus*, however comprehensive surveillance and epidemiological data on all BSI pathogens are a gap in Australia and require increased reporting from other jurisdictions to facilitate trend reporting and benchmarking in this area.

In conclusion, the data and discussions underscore the need for continued vigilance, surveillance, and targeted interventions to prevent HA-BSI. Additionally, promoting antimicrobial stewardship and adherence to infection prevention and control processes is vital to inhibit the rise of serious HA-BSI and the increase in HA-BSI with antimicrobial resistance.

Contributors to the SA Health ICS HAI Surveillance Program are advised to take note of the findings outlined in this report in accordance with their respective governance framework. Healthcare facilities should also prioritise compliance with The National Safety and Quality Health Service (NSQHS) Standards, including ongoing commitment to quality improvement initiatives concerning HA-BSI.

Acronymns

AICU	Adult intensive care unit
ANZICS	Australian and New Zealand Intensive Care Society
BSI	Bloodstream infection
CLABSI	Central line-associated BSI
CLUR	Central line utilisation rate
ESBL	Extended-spectrum beta-lactamase producing organisms
GNB	Gram-negative bacilli
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
HA-SABSI	Healthcare-associated *Staphylococcus aureus* bloodstream infection
VRE	Vancomycin-resistant enterococci
WA	Western Australia

References

1. Australian Commission on Safety and Quality in Health Care. National Safety and Quality Health Service Standards. 2nd ed. 2021.
2. Government of South Australia. South Australian Health and Wellbeing Strategy 2020-2025. In: Department of Health and Wellbeing, editor. 2020.
3. Australian Institute of Health and Welfare. Healthcare-associated infections NBEDS 2021–. In: Australian Institute of Health and Welfare, editor. 2021.
4. SA Health Enterprise Data and Information. Admitted Patient Care Data Elements 2022-2023. South Australian Admited Patient Activity Data Standards 2023.
5. Australian Commission on Safety and Quality in Health Care. Data Set Specification Version 4.0. 2012.
6. 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.
7. Australian Institute of Health and Welfare. Healthcare-associated Stapylococcus aureus bloodstream infections 2023 [Available from: https://www.aihw.gov.au/reports-data/myhospitals/intersection/quality/apc/healthcare-associatedinfections.
8. Australian Institute of Health and Welfare. Bloodstream infections associated with hospital care 2017–18: Australian hospital statistics. Canberra: AIHW; 2019.
9. Jonathan U, Rowena G, David G, Ashley A, Haroon A. All-cause and infection-attributable mortality amongst adults with bloodstream infection – a population-based study. medRxiv. 2023:2023.09.29.23296346.
10. van der Vaart TW, Prins JM, Soetekouw R, van Twillert G, Veenstra J, Herpers BL, et al. All-Cause and Infection-Related Mortality in Staphylococcus aureus Bacteremia, a Multicenter Prospective Cohort Study. Open Forum Infectious Diseases. 2022;9(12):ofac653.
11. Bai AD, Lo CKL, Komorowski AS, Suresh M, Guo K, Garg A, et al. Staphylococcus aureus bacteraemia mortality: a systematic review and meta-analysis. Clinical Microbiology and Infection. 2022;28(8):1076-84.

For more information

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