

# **Staphylococcus aureus Bacteraemia (SAB)**

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## **1. Introduction**

*Staphylococcus aureus* (*S. aureus*) is the most common cause of healthcare associated bacteraemias, causing significant illness and death; more than half of these infections are associated with healthcare procedures, and are thus potentially preventable.<sup>1,2</sup>

In 2008, Australian Health Ministers endorsed that all hospitals monitor and report *Staphylococcus aureus* (including methicillin-resistant [MRSA]) bloodstream infections through their relevant jurisdiction into a national data collection. In November 2008, *Staphylococcus aureus* bacteraemia (SAB) rates were included in the National Health Care Agreement Performance Indicators.<sup>3</sup>

The VICNISS SAB surveillance module is based on the “Draft Data Set Specification Surveillance of Healthcare Associated Infections: *Staphylococcus aureus* bacteraemia & *Clostridium difficile* Infection”, version 3.0.<sup>3</sup>

## **2. Aims**

- To accurately assess the rates of SAB within the Victorian healthcare system.
- To provide a method for individual hospitals to count SAB.
- To provide guidance on how to investigate the causes and prevention of healthcare associated SAB.

## **3. Methodology**

SAB surveillance includes all patients admitted to a public hospital with a bacteraemia caused by either Methicillin-susceptible *S. aureus* (MSSA) or Methicillin-resistant *S. aureus* (MRSA).

Each laboratory identified *S. aureus* positive blood culture should be reviewed by a healthcare worker trained in Infectious Diseases/Infection Control to determine if the clinical criteria listed in the SAB definition are applicable.

Each healthcare associated SAB should be further investigated to identify the cause and initiate corrective action if necessary to prevent future infections. Refer to the [Bloodstream Infection Fact Sheet and Guide for Investigation Sheets](#) on the VICNISS website.

## Setting

All public hospitals including psychiatric hospitals but excluding residential aged care beds/facilities must perform SAB surveillance.

## Requirements

SAB surveillance must be performed hospital-wide continuously.

Refer to the [Type 1 VICNISS Performance Indicators](#) and [Type 2 VICNISS Performance Indicators](#) on the VICNISS website for required SAB surveillance activities. For further information also refer to the [VICNISS Type 1 Surveillance Manual \(section 4.1\)](#) and the [VICNISS Type 2 Surveillance Manual \(section 4.3\)](#) on the VICNISS website.

## Definitions

***Staphylococcus aureus* Bacteraemia (SAB)** is defined as a positive blood culture for *S. aureus*. For surveillance purposes, only the first isolate per patient is counted, unless at least 14 days has passed without a positive blood culture, after which an additional episode is recorded.

A *S. aureus* bacteraemia (SAB) must meet one of the following criteria:

- **SAB definition 1 (Healthcare associated)**

The patient's first *S. aureus* blood culture was collected more than 48 hours after admission to this hospital or less than 48 hours after discharge.

- **SAB definition 2 (Healthcare associated)**

The patient's first *S. aureus* blood culture was collected less than or equal to 48 hours after hospital admission AND one or more of the following key clinical criteria (attributed to care at this hospital) was met for the patient episode of SAB:

1. SAB is a complication of the presence of an indwelling medical device (e.g. intravascular line, haemodialysis vascular access, CSF shunt, urinary catheter).
2. SAB occurs within 30 days of a surgical procedure where the SAB is related to the surgical site.
3. SAB was diagnosed within 48 hours of a related invasive instrumentation or incision.
4. SAB is associated with neutropenia (neutrophils:  $<1 \times 10^9/L$ ) contributed to by cytotoxic therapy.

Also see: Note 1 (below).

- **SAB definition 3 (Healthcare associated – at non-public hospital/health facility)**

The patient's first *S. aureus* blood culture was collected less than or equal to 48 hours after hospital admission AND one of the key clinical criteria in SAB definition 2 was met AND the key clinical criteria occurred as a result of care at a non-public hospital or other health facility (e.g. GP clinic, radiology clinic, private hospital).

- **SAB definition 4 (Community associated)**

The patient's first *S. aureus* blood culture was collected less than or equal to 48 hours after hospital admission and none of the key clinical criteria in SAB definition 2 were met.

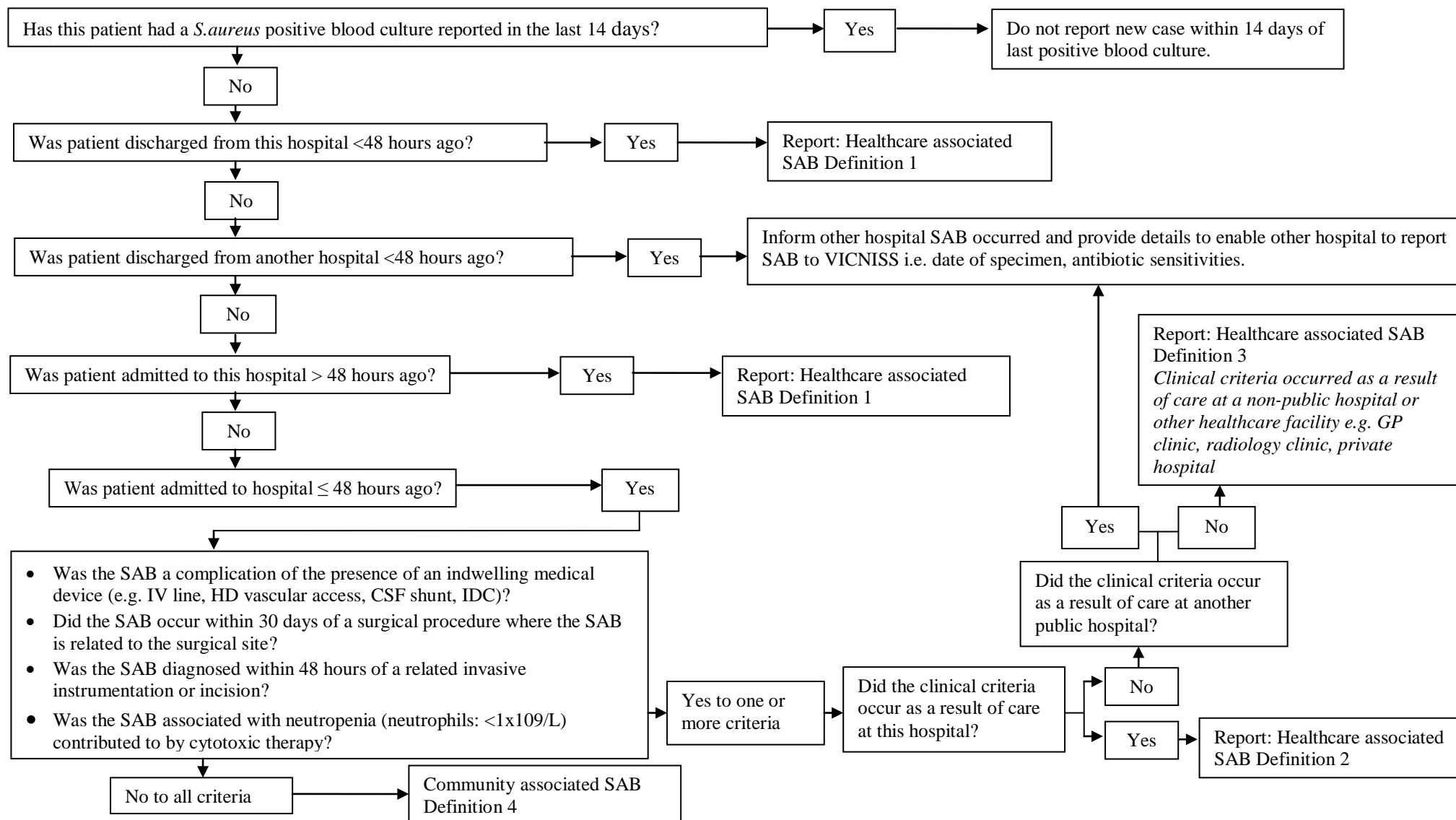
Notes:

1. Do not report *S. aureus* bacteraemia as SAB Definition 2 if key clinical criteria occurred as a result of care anywhere other than this public hospital. If it occurred as a result of care at another public hospital, inform that hospital a SAB has occurred. To assist the other public hospital to report the SAB to VICNISS you will need to provide required details e.g. date of culture and antibiotic sensitivities. If the SAB occurred as a result of care at a non-public hospital/health facility (e.g. GP clinic, radiology clinic, private hospital) see SAB definition 3.
2. Cases where a known previous positive test has been obtained within the last 14 days are excluded. For example: if a patient has SAB in which 4 sets of blood cultures are positive over the initial 3 days of the patient's admission only one episode of SAB is recorded. If the same patient had a further set of positive blood cultures on day 5 of the same admission, these would not be counted again, but would be considered part of the initial patient-episode. If the same patient had a further positive blood culture 20 days after admission (i.e. greater than 14 days after their last positive on day 5), then this would be considered a second patient-episode of SAB. There must be 14 clear days for a new case of SAB to be recorded for that patient.
3. A contaminated specimen can produce a false positive in surveillance systems. Contamination of blood cultures is rare in adults (1- 2% of culture positive episodes) and more common in children (5-10%). If, in the evaluation of a potential event: the clinical diagnosis is unsupportive of infection AND, either a repeat blood culture(s) is (are) negative; AND/OR no antimicrobial treatment is given, the positive blood culture should be regarded as a contamination and not reported in the surveillance data.
4. See Figure 1 (below) to assist determination whether a patient episode of SAB is Healthcare-associated or Community-associated:

**Intravascular (IV) Line-associated SAB:** is a primary blood stream infection (*Staphylococcus aureus* positive) associated with an IV line (central or peripheral) that was in place at the time of, or within 48 hours before onset of the event.

**Primary Bloodstream Infection (BSI):** is a laboratory confirmed bloodstream infection (LCBI) that is not secondary to a HAI meeting [CDC/NHSN HAI Criteria](#) at another body site.

**Figure 1. Determining if a patient episode of SAB is Healthcare-associated or Community-associated**



For example scenarios and application of SAB criteria see [Application of SAB Case Definitions](#) on the VICNISS website.

## Denominator Data

- Occupied bed-days (OBDs) are used for denominators.
- OBDs will be provided by the Victorian admitted episodes dataset (VAED), Department of Health, Victoria.
- *OBDs (monthly)* is the sum of all bed-days from the first day of the month to the last day of the month inclusive. If a patient was either admitted or separated from the hospital during the period, the number of bed-days that will be included in the OBDs figure will be only those that were incurred during this period
- For further information see [Data Analyses](#) (section 4 below).

## Numerator Data

- All patients admitted to the hospital are monitored for SAB until discharge. This includes hospital in the home (HITH).
- For the purpose of assessing acquisition of SAB a resident from a residential aged care bed/facility should be assessed the same as “from own home”.
- A VICNISS web based data collection form (web form) [Staphylococcus aureus Bacteraemia \(Numerator\)](#), is to be completed for **all SAB events that meet the criteria** outlined above.
- For more information on how to register and obtain access to web forms please see the [Web Based Data Collection Forms \(Web Forms\) User Guide](#) on the VICNISS website.
- For further explanation of required data fields see [Instructions for Completion of SAB Data Form](#) on the VICNISS website.

## 4. Data Analyses

SAB rates will be calculated for each hospital as:

- Number of patient-episodes of SAB divided by number of OBDs at the healthcare facility x 10000.

Several different rates are calculated for SAB reports. For example, SABs falling into definition 1 and 2 (healthcare-associated) are reported separately to those in definition 4 (community-associated).

VICNISS Reports include:

- Quarterly **hospital** SAB report will use the denominator: **acute bed days ONLY** (VAED Care type 4), multi stay AND day stay. These reports are included in the standard VICNISS [Type 1 Quarterly Reports](#) and [Type 2 Quarterly Reports](#) accessible on the VICNISS website.
- Quarterly **health service** (health agency) level report will use the denominator: **sum of all bed days** (VAED all care types [includes acute, rehabilitation and psychiatric; excludes residential aged care]), multi stay AND day stay. These reports are required by the Department of Health and includes SAB definition 1 & 2 (healthcare-associated) only. The health service level report is not available on the VICNISS website but is emailed separately to the Infection Control Coordinator at the health service

Please refer to the respective ‘How to Read the VICNISS Type 1 or 2 Surveillance Reports’ document updated and distributed with your hospital quarterly reports available on your secure web page on the VICNISS website (as per the links provided above).

## 5. References

1. Australian Commission on Safety and Quality in Healthcare. Cruikshank M, Ferguson J (ed). Reducing Harm to Patients from Health Care Associated Infection: The Role of Surveillance. July 2008
2. Collignon P, Nimmo GR, Gottlieb T, Gosbell IB. *Staphylococcus aureus* Bacteremia, Australia. Emerging Infectious Diseases 2005; 11(4):554-561
3. Australian Commission on Safety and Quality in Healthcare “Draft Data Set Specification Surveillance of Healthcare Associated Infections: *Staphylococcus aureus* Bacteraemia and *Clostridium difficile* infection”, version 3.0 July/August 2011

## Instructions for Completion of SAB Data Form

Please refer to the table below for instructions on each VICNISS data field.

### STAPHYLOCOCCUS AUREUS BACTERAEMIA (SAB) (NUMERATOR)

A [web form](#) is to be completed for each SAB event.

Data Field	Instructions for Data Collection
Hospital Code Number	Enter the VICNISS assigned hospital code number.
MRN (UR No.)	Enter the patient UR Number. This is the alphanumeric patient identifier assigned by the hospital and may consist of a combination of numbers, letters, spaces, dashes or leading zeroes, e.g., 000-123-A.
Sex	Select male or female to indicate the gender of the patient.
DOB	Enter the date of the patient's birth using this format: day/month/year (DD/MM/YYYY).
Date Admitted to Hospital	Enter the date patient was admitted to the public hospital using this format DD/MM/YYYY.
Discharge Date	Enter the date the patient was discharged from the hospital using this format DD/MM/YYYY.
Not yet discharged	Select if patient not yet discharged from hospital when web form submitted.
What was the main patient classification in the 48 hours prior to <i>S. aureus</i> positive blood culture being collected?	Indicate the patient classification in the 48 hours prior to blood culture collection from picklist: acute, rehabilitation, mental health (includes psychogeriatric), alcohol & drug, palliative care, or geriatric evaluation & management (GEM). If patient does not fit these categories select other and specify classification. If the patient fitted two classifications in the 48 hours prior to SAB choose the one where most time was spent.  Note: Patients presenting to hospital from home are usually classified acute.
Specimen Collection Date	Enter date that the positive <i>S. aureus</i> blood culture was collected using the format DD/MM/YYYY (this is the SAB episode date).
SAB Definition	Select if SAB meets either SAB definition 1, 2, 3 or 4. If SAB definition 2 indicated, select which key clinical criteria was met.
<u>SAB definition 1</u> (Healthcare associated):	Select if the patient's first <i>S. aureus</i> blood culture was collected more than 48 hours after admission to this hospital or less than 48 hours after discharge from hospital.
<u>SAB definition 2</u> (Healthcare associated):  <i>Clinical Criteria:</i>	Select if the patient's first <i>S. aureus</i> blood culture was collected less than or equal to 48 hours after hospital admission AND one of the following key clinical criteria was met:

Data Field	Instructions for Data Collection
<ul style="list-style-type: none"> <li>• Complication of the presence of an indwelling medical device</li> <li>• Occurs within 30 days of a surgical procedure</li> <li>• Diagnosed within 48 hours of a related invasive instrumentation or incision</li> <li>• Associated with neutropenia</li> </ul>	<ul style="list-style-type: none"> <li>• Select if SAB is a complication of the presence of an indwelling medical device (e.g. intravascular line, haemodialysis vascular access, CSF shunt, urinary catheter).</li> <li>• Select if SAB occurs within 30 days of a surgical procedure where the SAB is related to the surgical site.</li> <li>• Select if SAB was diagnosed within 48 hours of a related invasive instrumentation or incision.</li> <li>• Select if SAB is associated with neutropenia (neutrophils: <math>&lt;1 \times 10^9/L</math>) contributed to by cytotoxic therapy.</li> </ul> <p>NOTE: Do not report <i>S. aureus</i> bacteraemia as SAB Definition 2 if key clinical criteria occurred as a result of care anywhere other than this public hospital. If it occurred as a result of care at another public hospital, inform that hospital a SAB has occurred. To assist the other public hospital to report the SAB to VICNISS you will need to provide required details e.g. date of culture and antimicrobial susceptibilities. If the SAB occurred as a result of care at a non-public hospital/health facility (e.g. GP clinic, radiology clinic, private hospital) see SAB definition 3</p>
<p><u>SAB definition 3</u> (Healthcare associated):</p>	<p>The patient's first <i>S. aureus</i> blood culture was collected less than or equal to 48 hours after hospital admission AND one of the key clinical criteria in SAB definition 2 was met AND the key clinical criteria occurred as a result of care at a non-public hospital or other health facility (e.g. GP clinic, radiology clinic, private hospital).</p>
<p><u>SAB definition 4</u> (Community associated)</p>	<p>The patient's first <i>S.aureus</i> blood culture was collected less than or equal to 48 hours after admission and none of the key clinical criteria in SAB definition 2 was met.</p>
<p>SAB definition 1 &amp; 2 Only Was this an intravascular (IV) line associated SAB?</p>	<p>Required field for SAB definition 1 &amp; SAB definition 2 only</p> <p>Select Yes if criteria for IV line associated SAB are met. Select No if criteria for IV line associated SAB are no met. If SAB was not investigated to determine if event was IV line associated select Not Investigated.</p> <p>Criteria for IV line associated SAB include:</p> <ul style="list-style-type: none"> <li>• Meets criteria for a primary, laboratory confirmed Bloodstream Infection <i>and</i></li> <li>• an IV line (central or peripheral) was in place at the time of, or within 48 hours before onset of the event <i>and</i></li> <li>• The organism was not related to an infection at another site</li> </ul> <p>(for more information, see: <a href="#">SAB protocol, Methodology, Definitions</a> on the VICNISS website).</p>
<p>Antimicrobial Susceptibility</p>	<p>Complete antibiotic susceptibility matrix for all SABs. Each antibiotic must be selected as either Sensitive (S), Intermediate (I), Resistant (R) or Unknown (U).</p>
<p>Was an investigation (or root cause analysis) undertaken?</p>	<p>Select Yes if an investigation (or root cause analysis) of the SAB was undertaken. If an investigation was not undertaken indicate No.</p>

## STAPHYLOCOCCUS AUREUS BACTERAEMIA (SAB) (NUMERATOR)

If you have any queries regarding the completion of this form please contact VICNISS

**THIS DATA MUST BE SUBMITTED ELECTRONICALLY USING A VICNISS WEBFORM**

**Hospital Code Number:**

### Patient Identification & General Details

**MRN (UR No.):** \_\_\_\_\_ **Sex:** M  F  **DOB:** / /

**Date Admitted to Hospital:** / / **Discharge Date:** / / *OR*  **Not Yet Discharged**

**What was the main patient classification in the 48 hours prior to *S. aureus* blood culture being collected?**

acute       rehabilitation       mental health       palliative care  
 alcohol & drug       geriatric evaluation & management (GEM)       other, please specify: \_\_\_\_\_

### Infection Details

**Specimen Collection Date\*:** / / \*This is the SAB episode date

**SAB definition 1 (Healthcare associated)** - The patient's first *S. aureus* blood culture was collected more than 48 hours after admission to this hospital or less than 48 hours after discharge.  
*OR*

**SAB definition 2 (Healthcare associated)** - The patient's first *S. aureus* blood culture was collected less than or equal to 48 hours after hospital admission AND one of the following key clinical criteria was met for the patient episode of SAB:

- SAB is a complication of the presence of an indwelling medical device (e.g. IV line, HD vascular access, CSF shunt, IDC)
- SAB occurs within 30 days of a surgical procedure where the SAB is related to the surgical site
- SAB was diagnosed within 48 hours of a related invasive instrumentation or incision
- SAB is associated with neutropenia (neutrophils:  $<1 \times 10^9/L$ ) contributed to by cytotoxic therapy

*(NOTE: Do not report SAB as definition 2 if key clinical criteria occurred as a result of care anywhere other than this hospital. If it occurred as a result of care at another public hospital, inform this hospital a SAB has occurred and provide details e.g. date of culture and antibiotic sensitivities. If it occurred as a result of care at a non-public hospital/healthcare facility see SAB definition 3.)*

*OR*

**SAB definition 3 (Healthcare associated)** - The patient's first *S. aureus* blood culture was collected less than or equal to 48 hours after hospital admission AND one of the key clinical criteria in SAB definition 2 was met AND the key clinical criteria occurred as a result of care at a non-public hospital or other health facility (e.g. GP clinic, radiology clinic, private hospital).  
*OR*

**SAB definition 4 (Community associated)**- The patient's first *S. aureus* blood culture was collected less than or equal to 48 hours after hospital admission and none of the key clinical criteria in SAB definition 2 were met.

**SAB definition 1 & 2 Only** Was this an Intravascular (IV) line associated SAB?  Yes  No  Not Investigated

### Antimicrobial Susceptibility

Antibiotic	Susceptibility			
Methicillin (oxycillin or flucloxacillin)	<input type="checkbox"/> Sensitive	<input type="checkbox"/> Resistant	<input type="checkbox"/> Intermediate	
Ciprofloxacin	<input type="checkbox"/> Sensitive	<input type="checkbox"/> Resistant	<input type="checkbox"/> Intermediate	<input type="checkbox"/> Unknown
Clindamycin	<input type="checkbox"/> Sensitive	<input type="checkbox"/> Resistant	<input type="checkbox"/> Intermediate	<input type="checkbox"/> Unknown
Daptomycin	<input type="checkbox"/> Sensitive	<input type="checkbox"/> Resistant	<input type="checkbox"/> Intermediate	<input type="checkbox"/> Unknown
Erythromycin	<input type="checkbox"/> Sensitive	<input type="checkbox"/> Resistant	<input type="checkbox"/> Intermediate	<input type="checkbox"/> Unknown
Fusidic Acid	<input type="checkbox"/> Sensitive	<input type="checkbox"/> Resistant	<input type="checkbox"/> Intermediate	<input type="checkbox"/> Unknown
Rifampicin	<input type="checkbox"/> Sensitive	<input type="checkbox"/> Resistant	<input type="checkbox"/> Intermediate	<input type="checkbox"/> Unknown
Trimethoprim/Sulfamethoxazole	<input type="checkbox"/> Sensitive	<input type="checkbox"/> Resistant	<input type="checkbox"/> Intermediate	<input type="checkbox"/> Unknown
Vancomycin	<input type="checkbox"/> Sensitive	<input type="checkbox"/> Resistant	<input type="checkbox"/> Intermediate	<input type="checkbox"/> Unknown

**Was an investigation (or root cause analysis) undertaken:**  Yes  No<sup>#</sup>

<sup>#</sup> Further investigation is recommended for all healthcare associated SAB. (Refer to the [Bloodstream Infection Fact Sheet and Guide for Investigation Sheets](#) on the VICNISS website).