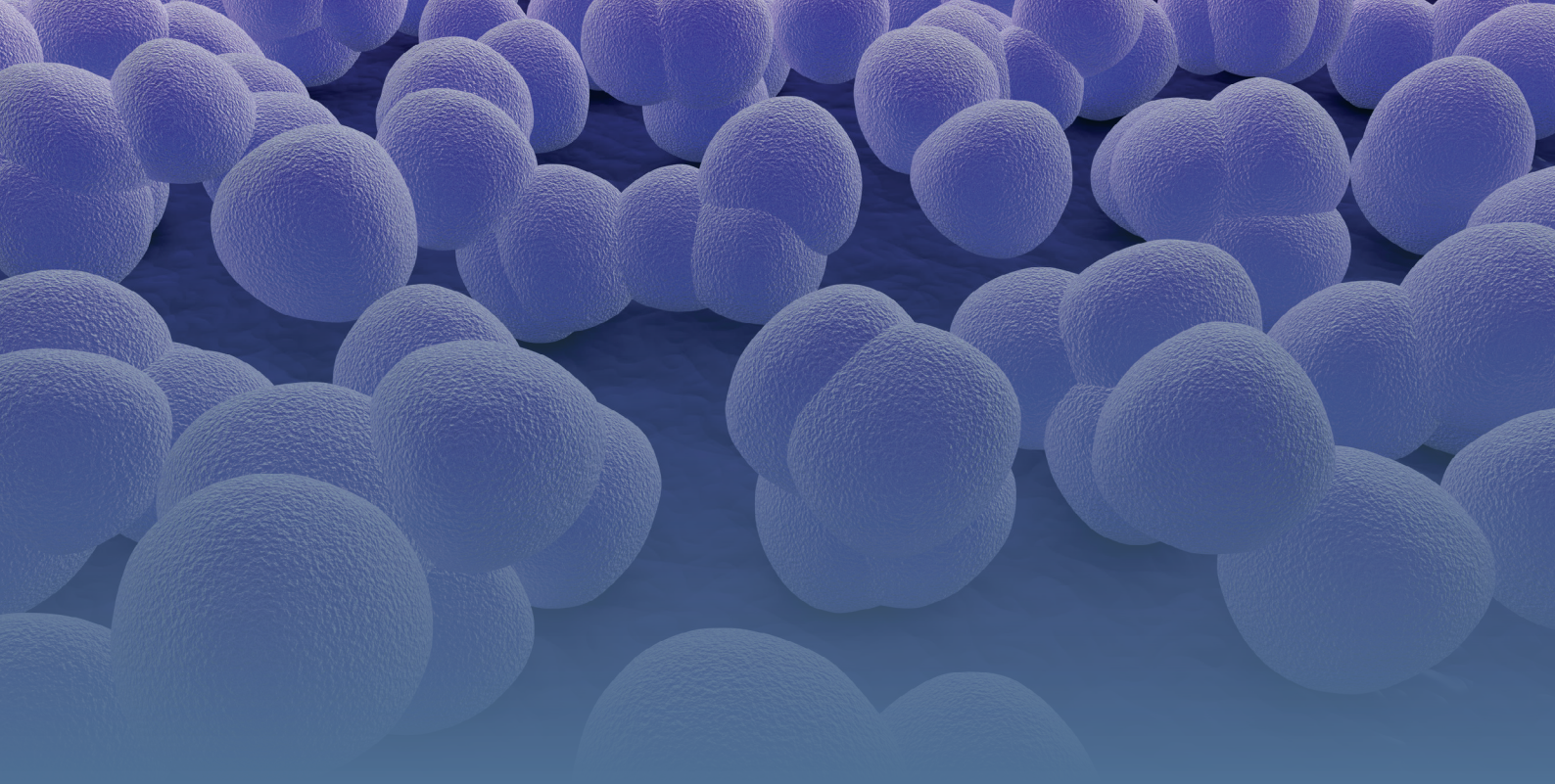

Implementation guide for the surveillance of *Staphylococcus aureus* bacteraemia (SAB)

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Contents

Acknowledgements: This document is based on the Australian Commission on Safety and Quality in Health Care (ACSQHC) *Implementation Guide for the Surveillance of* Staphylococcus aureus *Bacteraemia*, which the Healthcare Associated Infection Technical Working Group of the ACSQHC produced in 2013, and the Healthcare Associated Infection Advisory Group endorsed. To access the ACSQHC guide, go to: https://safetyandquality.gov.au/wp-content/uploads/2012/02/SAQ019_Implementation_guide_SAB_v10.pdf

Introduction

Background to SAB surveillance

Staphylococcus aureus (S. aureus) is the most common cause of healthcare associated bacteraemia in New Zealand and Australia. Half of all episodes of *S. aureus* bacteraemia (SAB) are attributed as healthcare associated infections (HAI) (Hill et al 2001; Collignon et al 2005). *S. aureus* is also the most common cause of HAI related to surgical site infections (Saadatian-Elahi et al 2008; Health Quality & Safety Commission 2017).

Surveillance of healthcare associated *S. aureus* bacteraemia (HA-SAB) provides important national data about a serious and potentially preventable HAI. The rate of HA-SAB is considered to be a robust outcome measure for the control of HAI because when *S. aureus* is identified in a blood culture, it is rarely considered to be a contaminant.

The majority of HA-SAB episodes are linked to medical procedures, such as the insertion of medical devices or surgery, and as such are potentially preventable (Collignon et al 2006, 2009; Worth et al 2014). Risk factors associated with these procedures (central line exposure, inappropriate indwelling medical device management, omission of appropriate antibiotic prophylaxis, breach of sterile surgical site, inappropriate wound care, etc) may increase the risk of SAB when other risk factors, such as poor hand hygiene, are present.

In 2012 the Health Quality & Safety Commission endorsed using the rate of HA-SAB per 1000 inpatient days as the outcome marker for the national hand hygiene improvement programme.

Purpose

This guide is for district health boards (DHBs) in New Zealand to use so that they can report on HA-SAB consistently, contributing to accurate national data and reliable information for quality improvement activities. The guide supports existing surveillance using the case definition that the Hand Hygiene New Zealand (HHNZ) programme has endorsed (see the next page).

This guide aims to support and standardise existing surveillance activities. It does not replace or inform clinical assessment of infections for patient management.

Case definition

An episode of SAB is healthcare associated if it meets the following criteria.

	Numerator definition	Denominator definition
Inclusions: When to identify SAB as healthcare associated	Healthcare associated SAB is isolation of *S. aureus* from one or more sets of blood cultures and: a. the patient acquired it while they were hospitalised in a DHB facility and it was not present or incubating on admission b. the first positive blood culture was collected more than 48 hours after admission or 48 hours or less after discharge **OR** it satisfies at least one of the following criteria (see page 4 for further detail): a. It is a complication of an indwelling device (eg, vascular catheter, urinary catheter). b. It occurs within 30 days of a surgical procedure or within 90 days of surgery involving implanted devices and is related to the surgical site. c. It is diagnosed within 48 hours of a related invasive instrumentation or incision. d. It is associated with neutropaenia ($< 1.0 \times 10^9$/L) contributed to by cytotoxic therapy	Monthly inpatient admission and discharge data from the National Minimum Dataset is used to calculate the number of inpatient bed days in the quarter.
Exclusions: When SAB is not healthcare associated	Do not count a SAB that recurs within 14 days of the original event as a new episode, as it qualifies as the same infection. **Maternally acquired infection:** This is an infection that a neonate acquires from the mother during delivery. Unless strong evidence suggests otherwise, classify an infection that appears less than 48 hours after birth as acquired from the mother.	Well babies, mental health patients, and boarders (eg, parent staying with a child) are excluded from the admission and discharge data used to calculate the number of inpatient bed days.

If an episode of SAB does not meet any of these criteria, then classify it as community acquired for the purposes of surveillance.

Notes on applying the HA-SAB definition

Case detection methods

- Undertake an active surveillance process for all HA-SAB cases. As part of this process, infection prevention and control teams should review cases in collaboration with clinicians responsible for the patients' clinical care to determine if they fit the healthcare associated definition. Further consultation with a clinical microbiologist or infectious diseases physician may be necessary if it is difficult to attribute the case.
- Exclude cases where a patient has had a known previous positive blood culture within the last 14 days.
- If the same patient has a further positive blood culture more than 14 days after their last positive blood culture, count this as a second patient-episode of SAB for surveillance purposes (Figure 1). This includes haemodialysis patients. Discuss these cases with clinical colleagues as sometimes they are relapsed infection.

The presence of contaminants

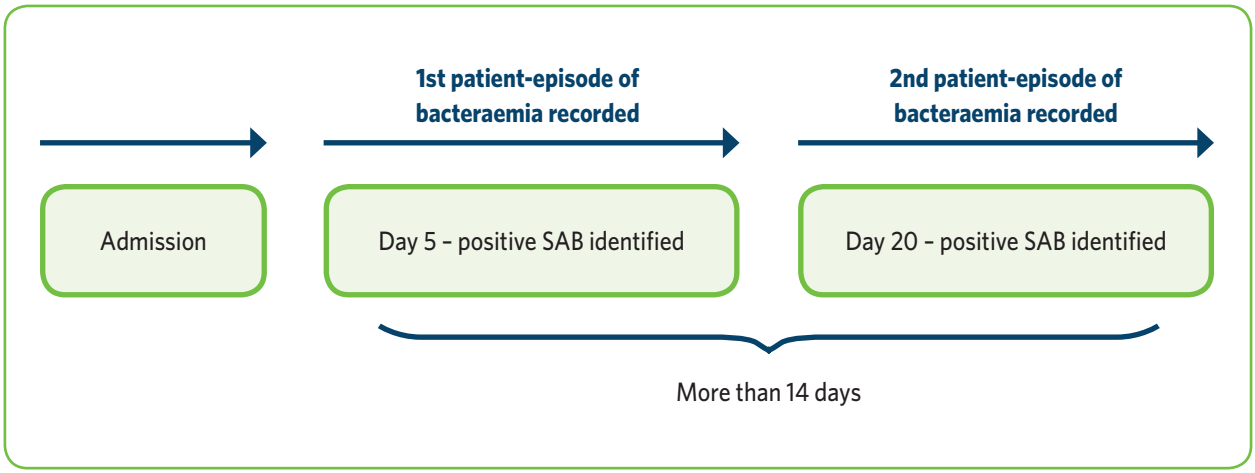
S. aureus is a rare contaminant in a blood culture of adults (identified as false positive in 1–2 percent of culture positive episodes) but can be more common in children (5–10 percent) (Hill et al 2001).

Only classify a SAB as a contaminant, which you do not report in the surveillance data, if the clinical picture does not support infection **and** either:

- a repeat blood culture is negative **and/or**
- no *S. aureus* targeted antimicrobial treatment is given.

Note: Best practice recommends that you collect two sets of blood cultures from separate sites on the patient to identify SAB. However, if the results are conflicting, investigate the episode to confirm it is a true bacteraemia (given *S. aureus* from a blood culture is rarely a false positive/ contaminant as noted above).

Figure 1: How to decide whether to record a second patient-episode of HA-SAB



How to apply the HA-SAB definition

Inclusions: When to identify SAB as healthcare associated

HA-SAB detected within 48 hours of admission to hospital

Use the following four criteria to identify episodes of HA-SAB that are detected within 48 hours of admission to hospital. Where SAB episodes occur in hospital after this period, you will almost always classify them as healthcare associated (unless you decide the infection was incubating on admission).

Some episodes of SAB may meet more than one of the four criteria for HA-SAB. As long as an episode meets at least one criterion, you should include it in the surveillance for HA-SAB if the patient has been in hospital less than 48 hours. (See Appendix 2 for a range of scenarios that illustrate how to apply the HA-SAB definition.)

a. HA-SAB as a complication of indwelling medical device – an intravascular device or other medical device

Identify an episode of SAB as a complication of an intravascular **(IV) device** (and so count/report it as healthcare associated) if:

- an **intravascular catheter** was present up to 48 hours before the SAB episode **and**
- you cannot identify any other focus of infection due to *S. aureus*.

  Note: This does not mean that the IV line had to be in place for at least 48 hours.

Note that an **introducer** used in IV procedures (eg, in angiograms) is an IV line according to National Healthcare and Safety Network (NHSN) definitions (Horan et al 2008). So you would count an episode of SAB occurring within 48 hours of a procedure using an IV introducer as healthcare associated unless you can identify a focus of infection (likely due to *S. aureus*) at another site.

For patients with **haemodialysis access devices** in place, attribute a SAB episode to such a device if you:

- have clinical evidence of infection at the vascular access site **or**
- cannot identify any other source of infection due to *S. aureus*.

Identify an episode of SAB as a complication of a **non-IV indwelling medical device** (and so count/report it as a healthcare associated SAB) if:

- the device was in place within 48 hours of the SAB **and**
- you have clinical or microbiological evidence of a *S. aureus* infection associated with the site of device insertion or an organ connected to the device.

Such devices include (but are not limited to) urinary catheters, percutaneous endoscopic gastrostomy (PEG) tubes, chest tubes, cerebrospinal fluid (CSF) shunts, peritoneal dialysis catheters, temporary pacing wires, nephrostomy tubes or other percutaneously placed tubes.

b. HA-SAB as a complication of a surgical procedure

- To count as an episode of SAB that is healthcare associated, the infection must meet the surveillance criteria of a superficial, deep or organ space surgical site infection that is proven or likely to be due to *S. aureus*.
- If a patient has a surgically implanted device, **extend the 30-day time limit to 90 days after surgery if you detect a deep incisional/ organ space infection related to the device**. This recognises the possibility of a delay in presentation of infections in this context. **Items classified as surgically implanted devices** include (but are not limited to) permanent pacemakers, joint prostheses, brain and spinal cord nerve stimulators, breast implants and surgical mesh.
- Attribute the episode of SAB to the hospital/ DHB that undertook the relevant surgery/ surgical manipulation previously.
- If a patient has repeated surgical procedures, even if these involve recurrent infection, attribute the SAB episode that meets the case definition to the hospital/DHB that undertook the most recent surgical procedure.

c. HA-SAB associated with invasive instrumentation or incision within 48 hours

- If more than 48 hours pass between invasive instrumentation or incision and the SAB episode, you must have compelling evidence that the infection was related to the invasive device or procedure before counting it as healthcare associated.
- If a patient has had multiple incisions or instrumentation, attribute the infection to the most recent procedure, and the facility that performed it. Examples of invasive instrumentation include (but are not limited to): pacing wires, endoscopic retrograde cholangiopancreatography (ERCP) and cardiac catheterisation.

d. HA-SAB associated with neutropaenia caused by cytotoxic therapy

- This criterion includes drug-related neutropaenia.
- It does not include neutropaenia from other causes such as disease-related neutropaenia.

Exclusions: When SAB is not healthcare associated

SAB incubating on admission

Do **not** count an episode of SAB as healthcare associated if you get a *S. aureus* positive blood culture from a patient more than 48 hours after admission, and there were clinical signs of staphylococcal infection documented on admission. Provided you have no evidence that the infection is associated with an earlier admission or medical procedure received in hospital (consistent with the HA-SAB definition), it is not healthcare associated.

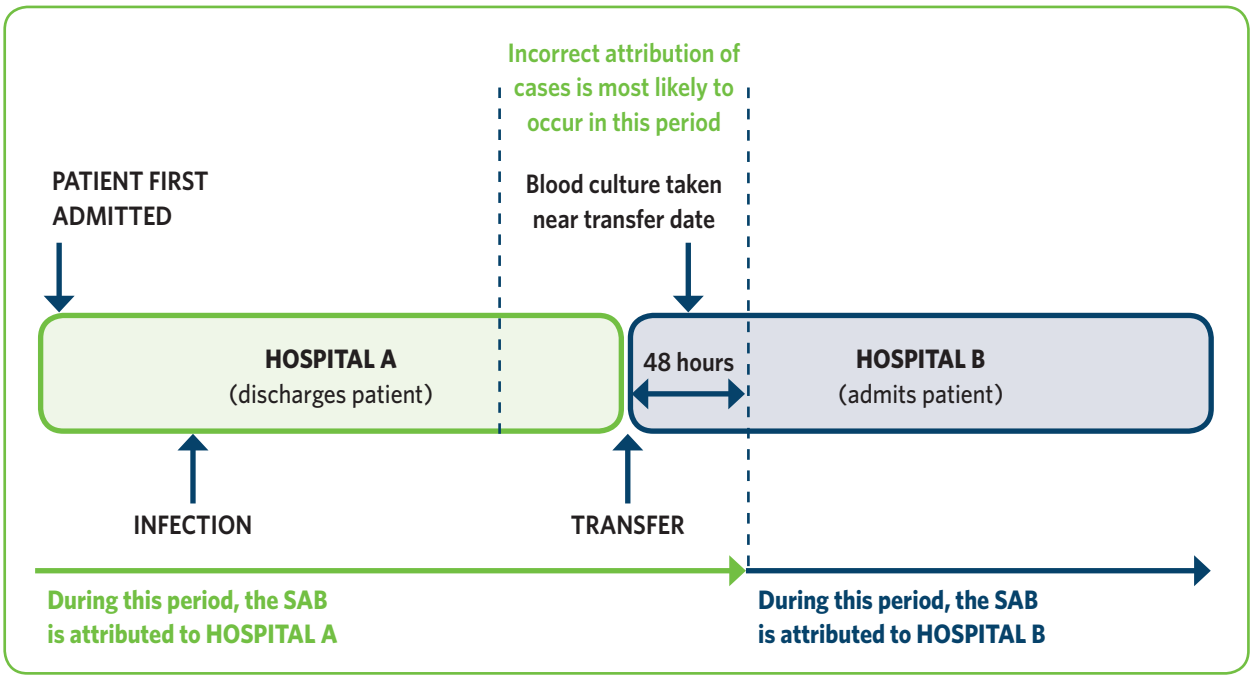
Make this decision in consultation with the patient's medical officer and/or an infectious diseases physician or clinical microbiologist. If there is significant uncertainty, then classify the episode as healthcare associated.

How to attribute HA-SAB when patients transfer between healthcare facilities

- When you identify an episode of bacteraemia as healthcare associated through surveillance, it is important to identify the source of the infection. In identifying the source of infection, consider whether it is linked with care provided at a different DHB (or a different healthcare provider) from the DHB that has detected the infection.
- The US Centers for Disease Control and Prevention has developed transfer rules to identify the location to which you should attribute individual cases of confirmed bacteraemia. If you identify a case within 48 hours of a patient's transfer from another facility, then attribute that case to the facility the patient came from. Note, however, that if you link the infection with a DHB-funded procedure performed in a private surgical hospital, you count it as an HA-SAB for the funder DHB, consistent with the approach of the Surgical Site Infection Improvement programme.
- Your surveillance processes for collecting the data should identify the time when blood cultures are collected in relation to a patient's transfer between hospitals (Figure 2).
- Good communication between healthcare facilities is key to attributing SAB cases correctly. With poor communication comes the risk that surveillance systems of both the hospital sending and the hospital receiving a patient could count the patient, or that both could fail to report cases altogether. The result could be reporting of inaccurate infection rates, as well as a failure to investigate and understand causes of infection.

See Appendix 2 for a range of scenarios that illustrate how to attribute HA-SAB when two facilities are involved in the patient's care.

Figure 2: How to attribute HA-SAB episodes in transferred patients to the correct facility



Numerator and denominator data for national surveillance

How to submit numerator data

The DHB hand hygiene coordinator should collate SAB numerator data monthly and submit it to Hand Hygiene New Zealand every quarter on the cloud-based spreadsheet. The required dates for submission are:

- 31 January
- 30 April
- 31 July
- 31 October.

To give you time to identify numerator cases, you have 30 days to submit numerator data from the end of each quarter. For example, you need to submit numerator cases detected in the quarter up to 31 December by 31 January.

If any issues arise when entering the data into the spreadsheet, DHB hand hygiene coordinators can email the national coordinator for help at: **HHNZ@hqsc.govt.nz**

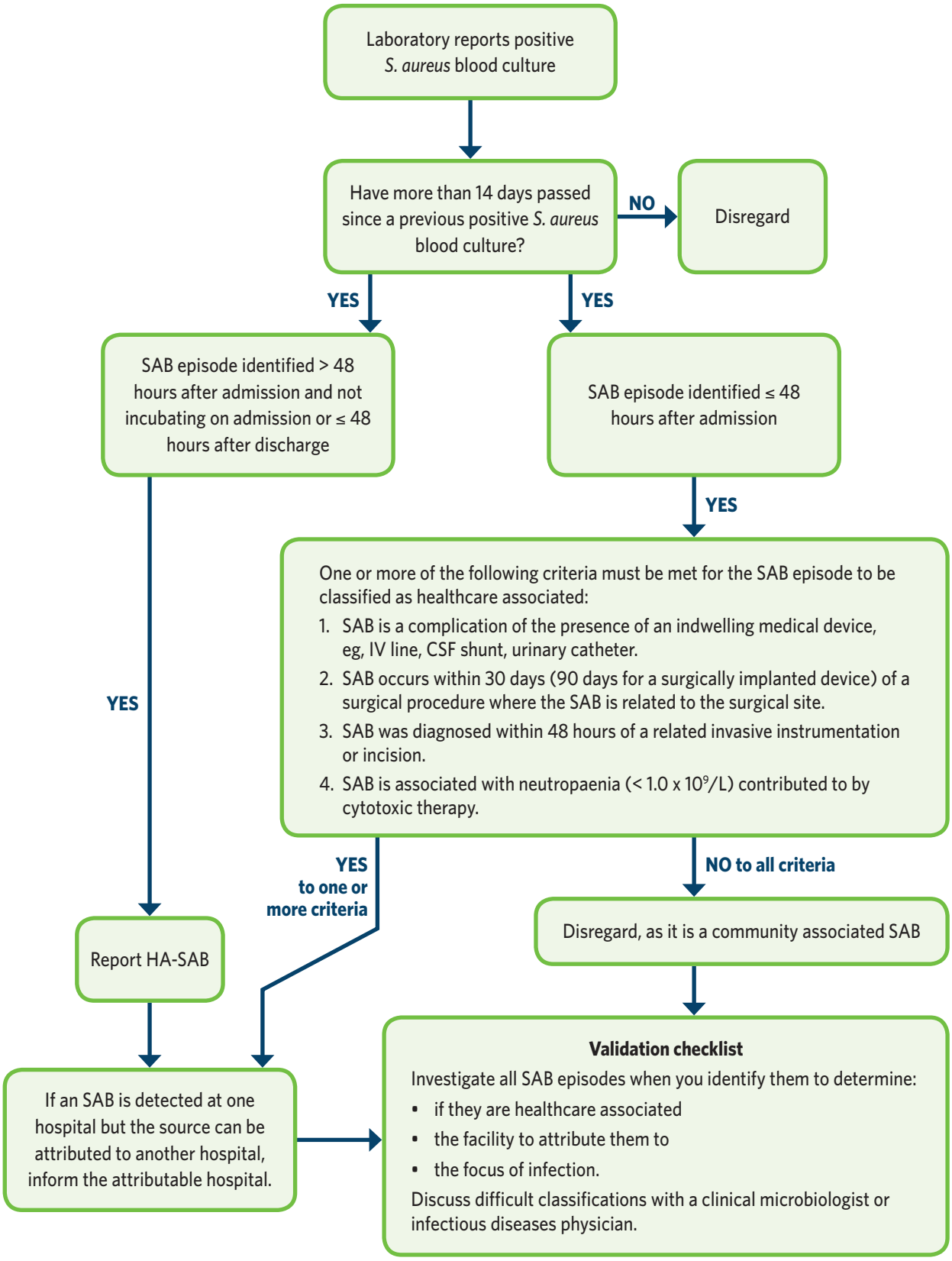
Denominator data

DHBs are no longer required to submit denominator data. The Health Quality & Safety Commission's health quality intelligence team is now calculating this data from the Ministry of Health's National Minimum Dataset.

To **determine the denominator for calculating HA-SAB rates**, the Commission's team uses the monthly inpatient admission and discharge data from the National Minimum Dataset to calculate the number of inpatient bed days in the quarter.

The team excludes well babies, mental health patients and boarders (eg, parent staying with a child) from the midnight census count for the purposes of calculating denominator data, as these groups have minimal risk of developing SAB during their hospital stay.

Appendix 1: Flowchart for identifying HA-SAB



Appendix 2: Examples of how to apply HA-SAB case definition

When you are collecting SAB data, you may need more information on some scenarios. See the table below for common scenarios and how to apply the current definitions of:

- healthcare associated: SAB occurs more than 48 hours after admission or within 48 hours of discharge
- healthcare associated: SAB occurs 48 hours or less after admission and meets one of the key clinical criteria
- community associated – SAB occurs 48 hours or less after admission and meets none of the key clinical criteria.

The scenarios use the following coding:

- **Hosp A** = DHB Hospital A
- **Hosp B** = DHB Hospital B
- **Community HCF** = community-based healthcare facility, such as residential aged care.

Scenario	Details	SAB criteria that apply	Attributable facility/ community	Rationale for classification
1	• SAB detected on admission to Hosp A • Patient discharged from Hosp A for less than 48 hours • Patient has intravascular line in situ associated with a previous episode of care in Hosp A	Healthcare associated: SAB occurs 48 hours or less after admission and meets one of the key clinical criteria	Hosp A	Hosp A reports HA-SAB (complication of an indwelling medical device)
2	• Patient in Hosp A for more than 48 hours, no blood cultures collected • Patient with IV in situ transferred to Hosp B, blood culture collected on admission – SAB detected	Healthcare associated: SAB occurs more than 48 hours after admission or within 48 hours of discharge	Hosp A	Hosp B infection control service informs Hosp A infection control service of SAB. Hosp A reports HA-SAB (collected less than 48 hours after discharge)

Scenario	Details	SAB criteria that apply	Attributable facility/ community	Rationale for classification
3	• Patient in Hosp A for more than 48 hours, SAB detected day 5 (AV fistula in situ – endocarditis) • Patient transferred to Hosp B, blood cultures on admission negative • Subsequent blood culture (within 14 days of the SAB in Hosp A, identified on day 5) – SAB detected	Healthcare associated: SAB occurs more than 48 hours after admission or within 48 hours of discharge	Hosp A	Hosp A reports initial SAB; Hosp B not required to report because case was a known previous SAB within last 14 days (there must be 14 full days for new SAB to be recorded). Note: This case highlights the importance of having accurate clinical notes in transfer summaries, and collaboration between Hosp A and B infection control services
4	• Patient presents to emergency department in Hosp A within 48 hours of an invasive radiological procedure at Hosp A – blood culture collected and SAB detected • Patient directly transferred to Hosp B for further management (not admitted to Hosp A), no further blood cultures collected	Healthcare associated: SAB occurs 48 hours or less after admission and meets one of the key clinical criteria	Hosp A	Hosp A reports SAB as HA. Hosp B not required to report SAB
5	• SAB detected in emergency department and patient admitted to Hosp A • Patient had total hip joint replacement (implant) two months ago in Hosp A – SAB related to deep incisional/organ space infection	Healthcare associated: SAB occurs 48 hours or less after admission and meets one of the key clinical criteria	Hosp A	Although infection has occurred less than 48 hours after admission, SAB is related to deep wound infection within 90 days of implant surgery

Scenario	Details	SAB criteria that apply	Attributable facility/ community	Rationale for classification
6	• Patient in Community HCF for more than 48 hours, blood culture collected and SAB detected • Patient transferred to Hosp A, no blood culture collected	Community associated	Community	SAB does not meet definition for HA. The Community HCF may investigate for its own quality improvement purposes
7	• Patient in Community HCF for more than 48 hours, blood culture collected and SAB detected • Patient transferred to Hosp A, blood culture collected on admission and SAB detected	Community associated: SAB occurs 48 hours or less after admission and meets none of the key clinical criteria	Community	SAB does not meet definition. Hosp A notes case as community-associated SAB and is not required to report
8	• Patient in Hosp A more than 48 hours with peripherally inserted central catheter in situ • Transfer to Hosp B, failed vascath insertion on admission • Blood culture collected eight hours after vascath attempt – SAB detected	Healthcare associated: SAB occurs 48 hours or less after admission and meets one of the key clinical criteria	Hosp B	Hosp B reports SAB as healthcare associated following invasive instrumentation, the most recent of which was in Hosp B
9	• Patient in Hosp A admitted with infected chronic leg ulcers that have isolated *S. aureus* • Patient has clinical signs of sepsis on admission • Blood culture taken four days after admission and SAB detected • SAB antibiotic susceptibilities same as wound swab	Community associated: SAB occurs 48 hours or less after admission and meets none of the key clinical criteria	Community	Hosp A not required to report SAB as does not meet definition. *S. aureus* positive blood culture from a patient more than 48 hours after admission, and there were clinical signs of staphylococcal infection documented on admission.

Scenario	Details	SAB criteria that apply	Attributable facility/ community	Rationale for classification
9A	• Patient in Hosp A admitted with a leg ulcer colonised with *S. aureus* • Patient has no clinical signs of sepsis on admission • Blood cultures taken four days after admission and SAB detected • SAB antibiotic susceptibilities same as wound swab	Healthcare associated: SAB occurs more than 48 hours after admission or within 48 hours of discharge	Hosp A	Hosp A required to report SAB: SAB detected more than 48 hours after admission
10	• Patient had aortic valve replacement and coronary artery bypass graft in Hosp A – May • Admitted to Hosp B six weeks later with deep sternal wound infection growing *S. aureus* and SAB detected on admission • SAB antibiotic susceptibilities same as wound swab • Aortic valve normal on echocardiography	Healthcare associated: SAB occurs 48 hours or less after admission and meets one of the key clinical criteria	Hosp A	Hosp A required to report SAB as per definition; Hosp B not required to report. Although deep wound infection occurred more than 30 days after surgery and is not related to implant, clinician involved in management of the patient judges that the SAB is healthcare associated. Hosp B should notify Hosp A for its information and records

Scenario	Details	SAB criteria that apply	Attributable facility/ community	Rationale for classification
11	• Patient admitted to Hosp A for drainage of ascites via catheter. Catheter removed and patient discharged one day later • Patient readmitted to Hosp A three days later with septic shock, SAB on admission • Ascites grows *S. aureus* • Insertion site not clinically infected • SAB antibiotic susceptibilities same as ascites specimen	Healthcare associated: SAB occurs 48 hours or less after admission and meets one of the key clinical criteria	Hosp A	Hosp A required to report SAB – invasive instrumentation with compelling evidence that the infection was related to the invasive procedure (*S. aureus* in ascites fluid)
12A	• Patient admitted to Hosp A for total hip joint replacement – July • Patient admitted to Hosp B for deep incisional/organ space wound infection, SAB on admission – September • Transfer to Hosp A for revision of total hip joint replacement	Healthcare associated: SAB occurs 48 hours or less after admission and meets one of the key clinical criteria	Hosp A	Hosp A required to report SAB as healthcare associated. Deep wound infection occurs within 90 days of implant surgery. Hosp B should make Hosp A aware of the event
12B	• Two months after revision surgery, patient admitted to Hosp A with deep total hip joint replacement infection, SAB detected on admission	Healthcare associated: SAB occurs 48 hours or less after admission and meets one of the key clinical criteria	Hosp A	Hosp A required to report SAB as healthcare associated: deep wound infection occurs within 90 days of implant surgery. Report according to last invasive procedure

Scenario	Details	SAB criteria that apply	Attributable facility/ community	Rationale for classification
13	• Patient undergoing chemotherapy as an outpatient at Hosp A via peripheral IV line • Admitted to Hosp B with febrile neutropaenia and SAB 10 days after last chemotherapy	Healthcare associated: SAB occurs 48 hours or less after admission and meets one of the key clinical criteria	Hosp A	Hosp A required to report SAB as healthcare associated. Hosp B should make Hosp A aware of the event
14	• Patient undergoing haemodialysis via arteriovenous fistula at Hosp A • Three days after last haemodialysis admission, patient presents with fever and SAB	Healthcare associated: SAB occurs 48 hours or less after admission and meets one of the key clinical criteria	Hosp A	Hosp A required to report SAB: haemodialysis access device (fistula) considered an indwelling device

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