AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

How to analyse *Staphylococcus aureus* bloodstream infection (SABSI) data for quality improvement

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Background

Staphylococcus aureus (*S. aureus*) bloodstream infection (SABSI) is commonly associated with significant morbidity and mortality. The majority of healthcare-associated *S. aureus* bloodstream infections (HA-SABSI) are related to poor hand hygiene practices, the presence of indwelling devices and other healthcare-associated procedures.[1] HA-SABSIs are regarded as preventable adverse events.[2]

This Information Sheet has been developed to support hospitals with the analysis, interpretation and utilisation of local SABSI data for quality improvement activities, which aim to prevent the occurrence of HA-SABSI and improve patient safety outcomes.

Introduction

Examining HA-SABSI data to identify preventable risk factors can help to inform the implementation of targeted improvement strategies in the quality and safety of patient care. Strategies may include policy and procedure development and review, healthcare worker or patient education, enhanced patient screening, using data to inform antimicrobial stewardship and the deployment of 'care bundles' for the insertion and management of indwelling devices.

A hospital's HA-SABSI rate is one indicator of the effectiveness of the hospital's infection prevention and control program.

Monitoring and reporting

How is HA-SABSI monitored and reported in Australia?

The Australian Health Ministers' Advisory Council (AHMAC) endorsed a revised national benchmark for SABSI, for the purpose of national reporting by public hospitals, of **1.0 per 10,000 patient days**. This benchmark commenced on 1 July 2020, replacing the previous benchmark of 2.0 per 10,000 patient days.

National data for HA-SABSI are reported and published by the Australian Institute for Health and Welfare (AIHW) on the MyHospitals website. Individual states and territories may also publicly report jurisdictional HA-SABSI rates.

Why should a hospital's HA-SABSI rate be monitored? How often should this be done?

SABSI is a serious cause of morbidity and mortality; is frequently recognised as being preventable [2] ; and, incurs considerable healthcare costs. Ongoing monitoring enables hospitals to identify aspects of clinical care that may contribute to the occurrence of preventable HA-SABSI. Once these factors are identified, a hospital will be better informed to develop targeted interventions to reduce the incidence of HA-SABSI occurring in the future.

Collecting Data

What information should be collected?

Collection of data consistent with the national SABSI surveillance case definition will provide an understanding of the burden and frequency of HA-SABSI in a hospital. In addition to collecting information according to the data elements, it may be helpful to collect the following information:

- Likely location of acquisition (community-associated or healthcare-associated) and onset (community or hospital)
- Primary source of infection (e.g. originated from an intravenous catheter or surgical site infection)
- Evidence of a delay in identifying or treating a primary infection
- Whether treatment for the primary infection was consistent with national/local guidance

- Whether the infection may be related to the presence of an indwelling device and if so, details of device insertion and management
- Whether any breaches in policy or procedure can be identified (e.g. poor insertion technique, intravenous [IV] line inserted in an emergency or uncontrolled situation, peripheral IV catheter [PIVC] left in when no longer needed).

Ways to analyse SABSI data for quality improvement

The following examples illustrate how hospitals can analyse their SABSI data to identify if targeted practice improvement is required:

1. Comparison to similar hospitals

Comparing a hospital's HA-SABSI rate to that of similar sized hospitals can provide an understanding of how a hospital is performing in relation to others. Successful strategies and interventions can be shared and implemented across groups of similar hospitals to promote changes in practice.

A valid comparison of HA-SABSI rates requires hospitals to use similar surveillance methodologies and definitions. Comparisons should take into account variation in patient numbers or patient demographics between different hospitals (See Considerations when analysing HA-SABSI data).

2. Resistant vs non-resistant SABSI

A hospital's SABSI rate can be stratified by comparing methicillin-resistant SABSI to methicillin-susceptible SABSI.

Knowing the relative proportions of each over time, will help to inform antibiotic prescribing and usage, help to identify changes in local trends, and give additional information on the burden of infection due to antibiotic-resistant strains.

Useful strategies could also include collaboration with microbiology departments and the use of antibiograms.

3. Community onset vs hospital onset

Determining the onset of HA-SABSI is important to identify future prevention efforts, e.g. inpatient or outpatient settings. For example, identification of a high rate of community-onset HA-SABSI might lead to revision of patient education resources on indwelling device management in the home. The identification of a high rate of hospital-onset HA-SABSI might trigger an audit of staff compliance with hand hygiene or the hospital's indwelling device insertion and management policies in a particular ward or unit.

4. Community-associated vs hospital-associated

Community-associated infections provide a reservoir that contributes to healthcare-associated infections, which fuel transmission both outside and within healthcare settings. Emerging evidence suggests community-associated SABSI is not declining.[3, 4] It is incorrect to assume that if the isolate is methicillin-resistant, that the infection is hospital-associated. Recent data has shown that the majority of methicillin-resistant SABSI are now associated with infections acquired in the community.[5]

Hospitals should respond to high rates of community-associated SABSI with targeted measures that are geared at preventing SABSI post-discharge, particularly for at-risk groups (e.g. IV drug users[6]), and reinforce the need for early SABSI recognition in emergency departments and in relevant community health services (e.g. wound care, hospital-in-the-home, renal, oncology).

5. Comparison over time

Comparing current HA-SABSI data to previous reporting periods provides a basis for investigating reasons for increased rates and for evaluating the effectiveness of interventions.

Higher than average rates should prompt local action such as staff training and education, policy compliance assessment and review of policy and procedure to improve clinical practice. Conversely, if the average rate is decreasing, any recent interventions and practice improvements can be identified, shared, and further embedded into routine clinical care.

When comparing the MRSA screening program, over time, consider the following questions:

- How effective is the program?
- How is it validated?
- What is the burden of MRSA in the ward/facility?
- Is the burden increasing or decreasing?
- What do the data indicate about what may be happening?
- Are there seasonal trends, or local activities that may impact on changes over time?

6. Comparison of modifiable risk factors

SABSI may be attributable to intrinsic risk factors such as age, sex, pre-existing health conditions and immune status, and potentially modifiable extrinsic risks factors such as the presence of an indwelling device, admission to an intensive care unit, skin preparation or a surgical procedure.

Identifying modifiable risk factors can better inform planning and implementation of targeted infection prevention and control strategies to reduce the risk of infection.

Consider the example in Figure 1 comparing the rate of device-related HA-SABSI to non-device related HA-SABSI. In reviewing these results, the larger contribution of intravascular devices to HA-SABSI rates can be seen. It may be helpful to consider the following questions:

- Are appropriate devices always being used?
- Was a device inserted in an emergency situation where asepsis may have been compromised?
- Are devices removed as soon as they are no longer clinically indicated, as per hospital policy or when signs and symptoms of complications are evident (e.g. pain, redness, swelling, purulent discharge)?
- Has appropriate management of the device and insertion site been followed?
- Is the anatomical location of the device a risk factor?
- What are the hand hygiene compliance rates at the place of insertion and subsequent management?
- Is the switch from intravenous to oral antimicrobial therapy being optimised?
- Are audits undertaken and what do they show?

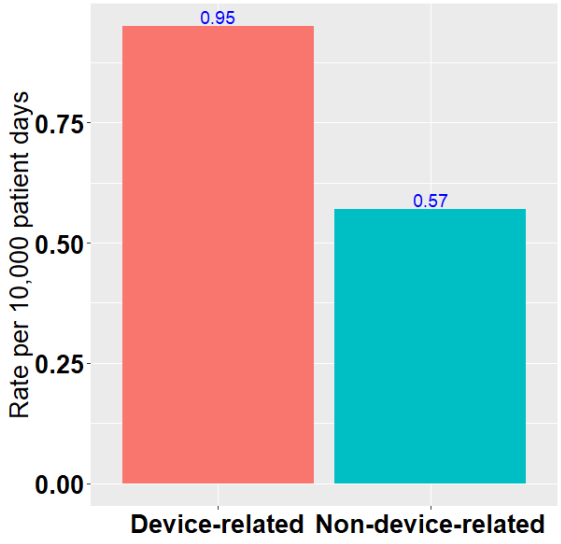

Figure 1: Device-related SABSI vs Non-Device-related HA-SABSI at "St Elsewhere's" Hospital

Reviewing the information at this level of detail will enable identification of clinical practices that are working well and those that may require review. Recommendations regarding the management of intravascular devices can be found in the Australian Guidelines for the Prevention and Control of Infection in Healthcare and the Peripheral Venous Access Clinical Care Standard.

7. Clinical setting

Examining HA-SABSI rates by clinical setting can help to identify if there is a greater risk, or incidence, in certain areas, and allows the implementation of specific strategies to address these risks.

For example, an increased rate of HA-SABSI in a perioperative unit may prompt a hospital to consider reviewing its pre-surgical admission process with regards to *S. aureus* screening, decolonisation and surgical antimicrobial prophylaxis. If infections are repeatedly related to one type of surgery, an outbreak investigation may also be required.

The outcome of this review may also indicate a need to reinforce education on preoperative screening or antimicrobial prophylaxis guidelines, or introduce strategies to suppress *S. aureus* colonisation in patients undergoing high-risk surgical procedures.[3, 7]

Considerations when analysing HA-SABSI data

When interpreting data, consideration should be given to patient demographics such as age, comorbidities and lifestyle factors such as injectable drug use (IDU). These factors should be taken into account to ensure that the most appropriate comparisons are made. Some simple ways to do this include:

- Comparing similarly aged patient populations (e.g. HA-SABSI in children should be analysed separately to HA-SABSI in adults)
- Analysing HA-SABSI in high-risk patients and high-risk clinical settings separately to other patient demographics and settings.

A HA-SABSI in a small hospital is an uncommon event and is an unreliable indicator of practice change. For these settings, a structured process such as a Root Cause Analysis (RCA) can identify contributing factors, explore and identify risk reduction strategies and assist in the implementation of solutions. Other types of information such as aseptic technique compliance and surgical prophylaxis guideline compliance audit data may also complement the HA-SABSI surveillance program.

Focus on clinical significance as well as statistical significance. Clinical significance reflects the impact of SABSI on a patients' wellbeing and quality of life, as well as the impact on the delivery of clinical services. Statistical significance is a good marker of the reliability of the results of an analysis, but it can be influenced by the size of the population in a hospital and may not necessarily represent a clinically important result.

Share the findings

1. Clinician feedback

Providing timely and relevant feedback to clinicians on clinical practice is known to have a positive effect on improving infection rates.[1] Since a high proportion of HA-SABSI are considered preventable, providing clinicians with feedback can help increase awareness of preventative measures and how to recognise and address risk factors. Regular feedback also reinforces policy and organisational expectations to improve patient safety outcomes.

Reporting HA-SABSI data at formal and informal clinician and departmental meetings also provides opportunities to feedback on existing quality improvement initiatives and to highlight best practice outcomes.

2. Organisational feedback

Reporting HA-SABSI data to peak governance committees is important for raising awareness and accountability for prevention and seeking additional resourcing to support HA-SABSI prevention programs. A hospital's peak governance committees will usually include clinical or medical services, infection prevention and control, antimicrobial stewardship, drug and therapeutics, clinical governance and quality assurance.

National Safety and Quality Health Service (NSQHS) Standards

This resource is intended to support health facilities in meeting the requirements of the following NSQHS Standards:

- Clinical Governance Standard Actions 1.1, 1.3, 1.5 and 1.6
- Preventing and Controlling Healthcare-Associated Infection Standard Actions 3.1, 3.2 and 3.4
- Communicating for Safety Action 6.1.

For more information on the Commission's work on SABSI prevention, surveillance and data analysis, visit:

Staphylococcus aureus Prevention Resources

Surveillance for *Staphylococcus aureus* bacteraemia

Basic of Epidemiology and Statistics eLearning Module

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