Staphylococcus aureus Bacteraemia (SAB) Investigation Tool

Part 1 – Information on SABs and their investigation to achieve safer systems

This investigation tool should be used when the primary infection which caused a SAB cannot be identified from local enhanced surveillance.

This tool will enable thorough investigation of patients with a SAB (hospital acquired, community onset-healthcare associated and community acquired) to find the primary cause and, where possible, through system change, reduce the risk of further SABs occurring.

May 2010:
Review December 2010
Information on SABs, and their investigation

Staphylococcus aureus bacteraemias (SABs)

*Staphylococcus aureus* bacteraemias (SABs) are severe life-threatening infections with an associated mortality of approximately 30%. They are in the main associated with healthcare. They can represent a failure to prevent, and or to effectively treat a primary infection. SABs are considered to be the most preventable of all healthcare associated bacteraemias. By identifying the antecedent events that led to the patient having *Staphylococcus aureus* isolated from their blood, HCWs should also be able to identify what possible system changes could be made to reduce the risk of recurrence in this or any other patient. **Merely knowing the cause of a SAB without system change is an ineffective ending to an investigation.** Identifying the cause of any individual SAB should be considered a team pursuit. It not about finding fault *per se*, it’s about making healthcare systems safe.

This tool has been developed following in-depth investigations of patients with SAB. The default position is that SABs are hospital or healthcare associated infections unless and until proven otherwise. If the SAB investigation identifies the origin to be hospital or healthcare associated the investigators must, with deep examination, consider what could have been done to prevent it. There will be occasions when nothing could have been done to prevent a SAB, such a conclusion should only arise from investigations that show a reluctance to explain away critical findings, or over simplify them. The two quotes below emphasise the process is not about identifying individuals’ weaknesses, but weaknesses in systems that need improving to reduce SABs.

“When an adverse event occurs, the important issue is not who blundered but how and why the defences failed.”
James Reason

“Human error is not the conclusion of an investigation. It is the starting point.”
Sidney Dekker
Internal Systems

There must be a local investigation when *Staphylococcus aureus* is isolated from a patient’s blood culture. This investigation should take place as near to the time when the culture is positive as is possible; and be completed within 30 days of the isolation. The investigation should involve the clinicians as well as the infection control team. Local enhanced surveillance may identify the primary infection cause of the SAB, but when this does not occur this SAB Investigation Tool may help by providing examples of data necessary to identify the primary cause(s). As a consequence of the investigations, clinical teams working with infection control colleagues should ensure that lessons are learned and systems changed to prevent and reduce the risks of SABs.

Governance of SAB investigations

There should be oversight of the investigation process by the Clinical Governance Team / Committee, to ensure that the process of identifying and subsequently investigating the causes of SABs is robust and that there is shared learning and system change as a consequences of that learning.

Surveillance definition of a *Staphylococcus aureus* bacteraemia (SAB)

*Staphylococcus aureus* bacteraemia (MRSA and MSSA) is defined as a person from whose blood MRSA or MSSA has been isolated and reported by a diagnostic microbiology laboratory in the absence of a positive blood culture in the previous two weeks.

Although the surveillance protocol does not exclude ‘contamination’ as a cause of the *Staphylococcus aureus* in the blood, this investigation tool does. Contaminated blood cultures as well as being a waste of clinical resources and can have negative consequences for patients including, for example, exchange of catheters that are not infected, use of antibiotics that are not required and unnecessary additional investigations.
Key information in the investigation of any SAB

The following statements summarise what Part 2 of this SAB Investigation Tool is trying to determine:

- **Was there a clinical indication to collect blood for culture?**
  - To confirm this was a clinical illness and not a contamination.

- **What was the primary cause of the infection?**
  - To identify whether the primary infection was healthcare associated.

- **Was there a delay in either identifying or treating a primary infection?**
  - To find out if treatment could have been instigated earlier.

- **Was the treatment for the primary infection as per local/national guidance?**
  - To find out if the treatment was optimal and effective against the specific *Staphylococcus aureus* antibiogram.

- **Where in the healthcare environment, if at all, was the SAB likely to have originated?**
  - To alert HCWs to the consequences of their care and the possible need to change systems.

Answers to the above questions, will be identified from completion of Part 2, the data collection section, of this SAB Investigation Tool. Once a primary infection cause has been found, or contaminated cultures are identified as the cause of the *Staphylococcus aureus* isolated from blood, then the next part of the investigation begins – finding out, if and how, the system defences failed.

The flow chart for the investigation and actions is shown on the next page.
**Staph aureus isolated from blood specimen**

- Was the specimen contaminated?
  - Yes: In hospital for more than 48 hours?
    - Yes: Hospital onset risks and causes analysis
      - **Actions:** improve blood culture sampling systems
    - No: Community onset risks and causes analysis
      - **(Community onset, healthcare associated)**
        - **Yes:** Truly community acquired?
        - **No:** Contaminated sample
        - **Actions:** was it preventable, what system defences can be improved patient care (e.g. bundles)
      - **Actions:** was it preventable, could public health or primary care teams help to reduce the risk of recurrence

**Flow chart of decisions to actions when investigating patients with Staphylococcus aureus isolated from blood**
Identifying Potential System Improvements

Having identified the cause of the SAB, the next step is to identify the systems that could be improved to reduce the risk of recurrence, for example, if the primary infection was caused by a peripheral vascular catheter (PVC) that was left in situ too long, and perhaps on reflection not required, then one solution would be to use the PVC bundle in this area. Additionally, a more in-depth look at the system of using PVCs may identify other opportunities to better defend the system as illustrated below.

**Questions to aid process assessment pre improvement for patient safety**

- Who puts PVCs in; are they clear about when they should and should not be used?
- What decision aids are available, e.g. is it routine for all patients to get a PVC regardless of health status?
- Who checks on the appropriateness of the decisions to use PVCs, do they have data?
- What is in place to ensure:
  - The correct sized of device is used?
  - Aseptic technique is used?
  - There is daily assessment of the continuing need for the PVC?
  - Devices are removed within 72 hours?
- Is it easy for the HCW to do the right thing with regard to using PVCs and minimising SAB risk?
- What should be the first thing changed to improve the process?

The table below provides suggestions of potential opportunities to improve the system of using PVCs.

<table>
<thead>
<tr>
<th>Opportunities for improvement in Peripheral Vascular Catheter (PVC) care</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Provide clear criteria for when PVCs should and should not be used.</td>
</tr>
<tr>
<td>o Consider having an automatic stop date for removal of PVCs</td>
</tr>
<tr>
<td>o Optimise the insertion technique for PVCs</td>
</tr>
<tr>
<td>o Provide an insertion pack for PVCs</td>
</tr>
<tr>
<td>o Consider making the insertion of a PVC an observed aseptic procedure.</td>
</tr>
<tr>
<td>o Use the PVC bundle</td>
</tr>
</tbody>
</table>
Similar opportunities can be identified for all primary causes of SAB and for reducing contaminated blood cultures. Below are questions and opportunities for improvement for patients with a SAB caused by an infected pressure sore:

**Example of systems examination for a patient whose SAB was acquired from a pressure sore**

<table>
<thead>
<tr>
<th>Key questions</th>
<th>Possible opportunities for improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the patient arrive in hospital with a pressure sore?</td>
<td>Are there opportunities for the improvement in pressure sore prevention in, for example, nursing homes?</td>
</tr>
<tr>
<td>Was the pressure sore assessed effectively on admission?</td>
<td>Is it possible to make the assessment of pressure sores on admission easier?</td>
</tr>
<tr>
<td>Was an appropriate dressing regimen commenced?</td>
<td>Can criteria for swabbing pressure sores be made clearer and more accessible?</td>
</tr>
<tr>
<td>Was everything done to prevent a pressure sore occurring?</td>
<td>Consider how the prevention of pressure sores can be improved on this ward.</td>
</tr>
<tr>
<td>Was the pressure sore swabbed as soon as there was a clinical indication of an infection?</td>
<td>Consider how to make it easier to recognise the need to send swabs promptly. Would review by a tissue viability nurse help identify where possible system improvements could be made.</td>
</tr>
</tbody>
</table>

**The Model for Improvement and PDSA cycle**

The Scottish Patient Safety Programme (SPSP) is advocating in all NHS Boards the use of the Model for improvement and Plan Do Study Act (PDSA) cycle to improve systems through small tests of change achieved with a clear understanding of what is being done and why, and crucially how it will be recognised that change is improvement. Infection Control Teams can assist local clinical teams in advocating use of PDSA and a means of making systems safer and reducing the risk of SAB recurrence in a given clinical area.

A PDSA test of change form is illustrated overleaf to start the process of improving systems.
Summary
This information contained in Part 1 of this SAB Investigation Tool is designed to provide framework and understanding of how SABs can represent a failure of systems rather than individuals. And, that any SAB investigations should not stop with the identification of a ‘cause’. The tool also provides information on how systems can be examined, opportunities for improvement identified and tests of system improvement commenced.

This SAB Investigation Tool is one of Health Protection Scotland’s tools to reduce healthcare associated infection. Feedback on the tool is warmly welcomed by email at: NSS.HPSInfectionContro@nhs.net
A Test of Change form using the PDSA cycle and sample completion

What are we trying to accomplish?  
Reduce unnecessary PVCs

How will we know that change is improvement?  
The PVC bundle will identify that all in situ PVCs are required

What changes can we make that will result in improvement?  
Implement the PVC bundle on the ward

<table>
<thead>
<tr>
<th>P</th>
<th>What are you going to do and what do you think will happen?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Try the PVC bundle on 1 patient with 1 nurse and all PVCs in situ will be required</td>
</tr>
<tr>
<td>D</td>
<td>What actually happened when you ran the test?</td>
</tr>
<tr>
<td></td>
<td>The patient had a PVC which was not required</td>
</tr>
<tr>
<td>S</td>
<td>How did the results compare with the predictions?</td>
</tr>
<tr>
<td></td>
<td>We are not as good as we think we are!</td>
</tr>
<tr>
<td>A</td>
<td>Describe what modifications will be made for the next test?</td>
</tr>
<tr>
<td></td>
<td>We will incorporate a daily device need check on all our patients.</td>
</tr>
</tbody>
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