Simple measures to reduce the rate of contamination of blood cultures in Accident and Emergency

M Madeo, T Jackson, C Williams

Objectives: To reduce the contamination rate of blood cultures taken in the Accident and Emergency (A&E) department.

Methods: The standard blood culture sampling kit was supplemented with an instruction sheet on the optimal method for drawing blood cultures and a large 62% ethyl alcohol impregnated wipe.

Results: There was a statistically significant reduction in the number of contaminants ($p = 0.03$).

Conclusions: Simple measures to encourage skin disinfection and appropriate sampling technique will reduce the incidence of contamination of blood cultures in the A&E department.

RESULTS

In the month before the intervention 50 sets of blood cultures were taken, 35 (70%) had no bacterial growth, three (6%) were judged to have significant growth, and 12 (24%) were judged to contain contaminants. In the month following the intervention 50 sets of blood cultures were also taken; 37 (74%) had no bacterial growth, nine (18%) were judged to have significant growth, and four (8%) were judged to contain contaminants. There was no statistically significant difference in overall bacterial growth following intervention.

DISCUSSION

The role of blood cultures in A&E remains open to question. However a reduction in the number of contaminants will optimise any relevance that a positive blood culture has to patient management. Most false positive blood cultures are caused by endogenous microbial skin flora so strict skin preparation and good venepuncture technique are important factors in reducing the rate of contamination. The most common bacterial contaminant identified was coagulase negative staphylococci (CNS); 12 CNS were identified in the month prior to the intervention but only three in the subsequent month.

Until the 1970s CNS were considered almost entirely to be contaminants arising from the skin flora. It is now recognised that CNS bacteraemia may be associated with the use of indwelling devices such as central venous or haemodialysis catheters or other prosthetic implants. In an earlier study when CNS were isolated in the first 48 hours of hospitalisation, an intravascular device was more frequently associated with episodes of true bacteraemia than in those considered as contamination (7 of 7 (100%) vs 10 of 57 (18%), respectively; $p < 0.001$). In the absence of such devices we have considered CNS to be contaminants.

Some studies have attempted to identify ways of reducing blood culture contamination rates. A study in the USA associated the use of a dedicated phlebotomy service ($p = 0.039$), use of tincture of iodine for skin disinfection ($p = 0.036$), and application of an antiseptic to the top of the collection device before inoculation ($p = 0.018$) with significantly lower contamination rates. Teaching institutions and a high rate of bed occupancy were demographic factors associated with higher blood culture contamination rates for inpatients. The type of blood culture method used...

Abbreviations: CNS, coagulase negative staphylococci.
• Withdraw 20 ml blood (5 ml from pre-teen children, 1–2 ml in neonates) and inoculate 10 ml into an aerobic bottle first then the remainder into the aerobic bottle.
• Do not change needles between venepuncture and inoculation of the bottles — reduces the risk of contamination and injury.
• Dispose of needle and syringe as a single unit in a sharps container
• Send the samples to the laboratory for incubation ASAP.

PATIENTS CURRENTLY RECEIVING ANTIBIOTICS ONLY 5 ML OF BLOOD SHOULD BE INOCULATED PER BOTTLE

Figure 1 Leaflet enclosed with each set of blood culture bottles.

Table 1 Results of blood cultures taken before and after the intervention

<table>
<thead>
<tr>
<th></th>
<th>Total blood culture sets (%)</th>
<th>No bacterial growth (%)</th>
<th>Significant bacterial growth (%)</th>
<th>Contaminated growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>50 (100)</td>
<td>35 (70)</td>
<td>3 (6)</td>
<td>12 (24)</td>
</tr>
<tr>
<td>Post</td>
<td>50 (100)</td>
<td>37 (74)</td>
<td>9 (18)</td>
<td>4 (8)</td>
</tr>
</tbody>
</table>

Table 2 Microorganisms recovered from the blood cultures

<table>
<thead>
<tr>
<th>Microorganisms</th>
<th>Significant growth</th>
<th>Contaminants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Staphylococcus epidermidis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Diptheroids</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Streptococcus spp</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Klebsiella spp</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

specimen volume, or use of a double needle collection procedure did not significantly affect contamination rates. The use of any skin preparation. We have found that the inclusion of an appropriate skin wipe and instruction sheet has significantly reduced the rate of contamination of blood cultures taken in our Accident and Emergency department.

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