

Taking Blood Cultures

A summary of Best Practice

Aims

To enable registered providers of care to review their policies for taking blood cultures and implement practice and procedures that improve the quality of blood culture investigations, increase quality and reduce risk and cost of care to patients from false positive blood culture results.

To promote good practice in the collection of blood for culture and thus reduce the number of false positive results and resulting complications for patient safety, quality and associated cost of care. In addition, to reduce inappropriate sampling of blood for culture¹.

Context

The culture of micro-organisms from blood is an essential laboratory test for the diagnosis of bacteraemia. Early positive results provide information on which appropriate treatment can commence.

Previously there has been little consistent or definitive advice to registered providers on how and when to take blood cultures and how best to avoid sample contamination. Variation in practice has contributed to a significant level of false positive readings. Blood culture contamination can complicate the level of patient care and artificially raise the incidence rate of MRSA bacteraemia. Reports from NHS trusts and equipment suppliers suggest that the contamination rate could be as high as 10%^{2,3}.

This guidance presents recommendations for all appropriate care settings where blood culture sampling may be required. Implementation of this guidance and adoption of the recommended procedure, will improve the quality and clinical value of blood culture investigations. Reducing the incidence of sample contamination and 'false positive' readings when taking blood cultures will help improve the quality of patient care and safety.

These recommendations aim to ensure that blood cultures are taken:

- for the correct indications;
- at the correct time; (i.e. not as part of resuscitation or emergency call out procedures) and;
- using correct technique in order to prevent contamination of the sample and minimise risk to patients and staff.

A false positive is defined as growth of bacteria in the blood culture bottle that were not present in the patient's bloodstream and were introduced during sample collection. Contamination can come from a number of sources: the patient's skin, the equipment used to take the sample and transfer it to the culture bottle, the hands of the person taking the blood sample, or the general environment.

Recommendations

A: Only take blood for culture when there is a clinical need to do so and not as routine

Blood cultures are taken to identify patients with bacteraemia. There are many signs and symptoms in a patient which may suggest bacteraemia and clinical judgement is required, but the following indicators (which may be subtle in the very young, the elderly, those on steroids or immuno compromised) should be taken into account when assessing a patient for signs of bacteraemia or sepsis:

- Pyrexia > 38^oC
- focal signs of infection
- abnormal heart rate (raised), blood pressure (low or raised) or respiratory rate (raised)
- chills or rigors
- raised or very low white blood cell count
- new or worsening confusion.

Please note: signs of sepsis may be minimal or absent in the very young and the elderly.

Blood cultures should be taken after identification of possible bacteraemia or sepsis and before the administration of antibiotics. If a patient is on antibiotics, blood cultures should ideally be taken immediately before the next dose, with the exception of paediatric patients.

All blood cultures should be documented in the patient's notes, including date, time, site and indications.

B. Competence

Blood cultures should only be collected by members of staff (medical, nursing, healthcare assistant, phlebotomist or technician) who have been trained in the collection procedure and whose competence in blood culture collection has been assessed and maintained.

C. Always make a fresh stab

In patients with suspected bacteraemia, **do not** use existing peripheral lines/cannulae or sites immediately above peripheral lines. If a central line is present, blood **may** be taken from this **and** from a separate peripheral site when investigating potential infection related to the central line; the peripheral vein sample should be collected first. Identify a suitable venepuncture site before disinfecting the skin. Avoid femoral vein puncture because of the difficulty in adequate skin cleansing and disinfection.

D. Thoroughly disinfect the skin before inserting the needle

Thoroughly cleanse the patient's skin before venepuncture. Use soap and water to clean visibly soiled skin and then clean your own hands using the correct hand hygiene technique (use of the World Health Organisation's '5 moments of hand hygiene' or the National Patient Safety Agency (NPSA) 'Clean you hands campaign' is recommended). Use 2% chlorhexidine in 70% isopropyl alcohol to disinfect the patient's skin and allow to dry.

E. Once disinfected, do not touch the skin again

To avoid cross-contamination from the collector's fingers (even when gloved), it is vitally important not to palpate the site again once it has been disinfected.

F. Disinfect the culture bottle cap before transferring the sample

Ideally, remove the plastic cover immediately before collecting the sample; the top of the bottle will be clean but not sterile. Disinfect the tops of the culture bottles with a 2% chlorhexidine in 70% isopropyl alcohol impregnated swab. Allow the alcohol to fully evaporate for 30 seconds before proceeding with bottle inoculation.

Please note: the use of blood collection adapter caps without winged blood collection sets is not recommended. It is not possible to accurately judge sample volume and there is the potential for possible backflow of blood culture media into patient veins.

Conclusion

All registered providers, as a matter of urgency, should investigate:

- their incidence of sample contamination and false positive reports, and ensure these are less than 3%.
- review their policies for taking blood cultures and the training of staff to determine the most appropriate approach to ensuring compliance with these recommendations.

Having agreed the approach locally, a High Impact Intervention tool for improvement may be developed to provide assurance of compliance to best practice.

Procedure for Blood Culture Sampling

Roles and responsibilities

Blood cultures should only be collected by members of staff (medical, nursing, healthcare assistant, phlebotomist or technician) who has been trained in the collection procedure and whose competence in blood culture collection has been assessed and maintained. It is good practice where a needle and syringe are being used to enlist an appropriately trained helper. This enables the person taking the cultures to focus on transferring the blood aseptically into the bottles, leaving the helper to release the tourniquet and care for the patient.

Step one: Skin preparation

- Clean hands using correct hand hygiene technique (use of the World Health Organisation's '5 moments of hand hygiene' or the NPSA 'Clean you hands campaign' is recommended).
- Clean any visibly soiled skin on the patient with soap and water then dry.
- Apply a disposable tourniquet and palpate to identify vein.
- Clean skin with 2% chlorhexidine in 70% isopropyl alcohol and allow to dry for 30 seconds.
- Do not repalpate skin following cleaning.
- If a culture is being collected from a central venous catheter, disinfect the access port with a 2% chlorhexidine in 70% isopropyl alcohol impregnated swab.

Step two: Kit preparation

- Have sharps disposal container available in immediate vicinity.
- Clean the tops of culture bottles with a 2% chlorhexidine in 70% isopropyl alcohol impregnated swab and allow to dry for 30 seconds.

Step three: Sample collection – Use method A as outlined below.

(Method B should only be used where method A is not available)

A: WINGED BLOOD COLLECTION SET METHOD

- Clean hands again using correct hand hygiene technique (use of the World Health Organisation's '5 moments of hand hygiene' or the NPSA 'Clean you hands campaign' is recommended) or use alcohol hand rub and apply clean examination gloves (sterile gloves are not necessary).
 - Gloves and apron are worn (in line with local policy)
 - Personal protective equipment (PPE) is disposed of correctly (in line with local policy) after use.
- Attach winged blood collection set to blood collection adapter cap.
- Insert needle into prepared site. Do not palpate again after cleaning.
- Place adapter cap over blood collection bottle and pierce septum.
- Hold bottle upright and use bottle graduation lines to accurately gauge sample volume and collect sample; inoculate aerobic culture first.
- If blood is being collected for other tests, always collect the blood culture first.
- Cover the site with an appropriate sterile dressing.
- Discard winged blood collection set in a sharps container.
- Clean hands using correct hand hygiene technique (use of the World Health Organisation's '5 moments of hand hygiene' or the NPSA 'Clean you hands campaign' is recommended) after removing gloves.

<ul style="list-style-type: none"> Document date, reason for sample, site of venepuncture, operator undertaking procedure and if procedure was high risk with signature.
B: NEEDLE AND SYRINGE METHOD
<ul style="list-style-type: none"> Clean hands again using correct hand hygiene technique (use of the World Health Organisation's '5 moments of hand hygiene' or the NPSA 'Clean you hands campaign' is recommended) or use alcohol hand rub and apply clean examination gloves (sterile gloves are not necessary).
<ul style="list-style-type: none"> Gloves and apron are worn (in line with local policy).
<ul style="list-style-type: none"> Personal protective equipment (PPE) is disposed of correctly (in line with local policy) after use.
<ul style="list-style-type: none"> Insert needle. Do not palpate again after cleaning.
<ul style="list-style-type: none"> Collect sample and release tourniquet.
<ul style="list-style-type: none"> Cover the puncture site with an appropriate dressing.
<ul style="list-style-type: none"> If blood is being collected for other tests, always inoculate the blood culture bottles first.
<ul style="list-style-type: none"> Inoculate blood into culture bottles; do not change the needle between sample collection and inoculation; inoculate anaerobic culture first.
<ul style="list-style-type: none"> Discard needle and syringe in a sharps container.
<ul style="list-style-type: none"> Clean hands again using correct hand hygiene technique (use the World Health Organisation's '5 moment of hand hygiene' or the NPSA 'Clean Your Hands Campaign are recommended).
<ul style="list-style-type: none"> Document date, reason for sample, site of venepuncture, operator undertaking procedure and if procedure was high risk with signature.

References

¹ Souvenir et al 1998. Journal of Clinical Microbiology July 2002 2437 – 2444, vol. 40 No.7

² Madeo, M. and Barlow, G. (2008) Reducing blood-culture contamination rates by the use of a 2% chlorhexadine solution applicator in acute admission units Journal of Hospital Infection 69, 207-309

³ Madeo, M, Davies, D., Owen, L., Wadsworth, P., Johnson, G. and Martin, C. (2003) Reduction in the contamination rate of blood cultures collected by medical staff in the accident and emergency department Clinical effectiveness in Nursing 7, 30-32.