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Review Lead: Lead Infection Prevention & Control Nurse

Calderdale and Huddersfield
NHS Foundation Trust

Section Z - Blood Culture Policy

Version 5.1

Important: This document can only be considered valid when viewed on the Trust's Intranet. If this document has been printed or saved to another location, you must check that the version number on your copy matches that of the document online.

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Infection, Prevention and Control Committee	Consultant Microbiologist / Infection Prevention & Control Doctor	April 2021
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Does this document map to other Regulator requirements?		

Document Version Control	
Version 5.1	The policy has been reviewed and minor amendments made.
Version 5	Minor amendments have been made: The procedure in Appendix 1 is written to reflect the ANTT process. Updated CHFT contamination rates have been added.
Version 4	Minor amendments made following review: Contamination rates to blood cultures statistics from 2014 added. ANTT information throughout the policy updated to reflect changes made within the organisation. Further information provided on the timing of blood cultures being taken.
Version 3	The document has been reviewed and updated and the volume of blood to be taken for blood cultures has been changed.
Version 2	The document has been reviewed and updated and an additional paragraph; Investigation of contaminated cases has been added to the process section of the policy. An additional one page summary of the policy has also been added as an appendix.

Contents

1. Introduction

Blood culture is the key investigation for the diagnosis of sepsis, and is used to detect the presence of bacteria (bacteraemia) and/or fungi (fungaemia) in the blood and is considered the gold standard (PHE, 2014).The incidence of sepsis continues to increase: It is estimated that there are 150, 000 cases of sepsis resulting in 44, 000 deaths annually in the UK alone (Sepsis Trust, 2018). Because the morbidity and mortality attributed to sepsis is high, prompt and accurate detection is important in improving patient care.

Inappropriately taken blood cultures decrease the usefulness of this investigation in the diagnosis and management of bloodstream infections (BSIs). Contaminated blood cultures can show an artificial increase in the incidence of BSIs e.g. MRSA bacteraemias and lead to inappropriate treatment, inappropriate antibiotic use, increase costs associated with these and laboratory processing costs. This also does not allow trusts to accurately show levels of improvement on infection rates.

This policy presents good practice recommendations advocated by the Department of Health best practice guidelines that when followed will improve the quality and clinical interpretation of blood cultures, expedite appropriate antibiotic treatment and reduce the incidence of 'false positive' blood cultures i.e. contaminants.

1.1 Key Points

This policy identifies

- How, when, and why a blood culture is taken
- Competence of those staff performing the procedure
- Process
- Documentation

2. Purpose

The aim of this policy is to ensure that blood cultures are taken:

- For the correct indication
- At the correct time
- From an appropriate site
- Using Aseptic Non Touch Technique (ANTT) in order to prevent contamination of the sample and minimise the risk to patients and staff
- Ensuring correct documentation

3. Scope

This policy applies to all medical staff and healthcare staff who have undertaken training in the collection of blood cultures and should be used in conjunction with:

- Venepuncture Policy
- Aseptic Non-Touch Technique (ANTT)
- Hand Hygiene Policy
- CVAD Policy
- CHFT antibiotic guidelines
- Microbiology minimum dataset policy for clinical specimens
- Sepsis Bundle.
- Specimen Collection, Handling, and Transportation Policy.

4. Definitions

Bacteraemia: The presence of viable bacteria in the blood stream.

Blood Culture: Collection and inoculation of blood into a culture medium in order to grow pathogenic bacteria or fungi for diagnostic purposes.

Central line related blood-stream infections: Bacteraemia/fungaemia in a patient with an intravascular catheter with at least one positive blood culture obtained from a peripheral vein, clinical manifestations of infections (i.e., fever, chills, and/or hypotension), and no apparent source for the BSI except the catheter.

Contaminated specimen: The detection of a micro-organism with no clinical infection in the patient. The organism has usually been acquired during specimen taking. The patient's skin, equipment used, the hands of the practitioner and the general environment can all be sources. (Saving Lives, 2007).

Fungaemia: The presence of fungi in the blood stream.

Systemic inflammatory response syndrome (SIRS): A widespread inflammatory response to a variety of severe clinical insults. This syndrome is clinically recognised by the presence of two or more of the following:

- Temperature >38°C or <36°C
- Heart rate >90 beats/min
- Respiratory rate >20 breaths/min or PaCO2 <32 mmHg
- WBC >12x10*9/l, <4x10*9/l, or >10 percent immature (band) forms

Sepsis: The systemic response to infection. Thus, in sepsis, the clinical signs describing SIRS are present together with definitive evidence of infection.

Severe sepsis: Sepsis is considered severe when it is associated with organ dysfunction, hypoperfusion, or hypotension. The manifestations of hypoperfusion may include, but are not limited to, lactic acidosis, oliguria, or an acute alteration in mental status.

Septic shock: Septic shock is sepsis with hypotension despite adequate fluid resuscitation. It includes perfusion abnormalities such as lactic acidosis, oliguria, or an acute alteration in mental status. Patients receiving inotropic or vasopressor agents may not be hypotensive at the time that perfusion abnormalities are measured.

5. Duties (Roles and Responsibilities)

Chief Executive
The Chief Executive has overall responsibility and is accountable for ensuring that there is a managed environment which minimises the risk of infection to patients, visitors and staff.

Director of Infection Control
The Director of Infection Prevention and Control is responsible for ensuring that there are effective and appropriate arrangements for the prevention and control of infection throughout the Trust.

The Infection Prevention Control Team
The Infection Prevention and Control Team (IPCT) reports directly to the Director of Infection Prevention and Control (DIPC) and is responsible for aspects of surveillance, prevention and control of infection within the Trust. The IPCT is responsible for the implementation of the Trust's Infection Prevention and Control programme and for the development and dissemination of policies, guidelines, procedures and ANTT training. The IPCT is also responsible for the initial investigation of a MRSA Bacteraemia and ensures the subsequent investigation through Post Infection Review (PIR) within 7 days.

Microbiology Laboratory
Positive blood cultures are liaised by the microbiologists on day 1 (during hours) and followed up clinically as required. All MRSA bacteraemias are notified promptly to the infection control team and DIPC who is then responsible for cascading that information to the relevant parties.

Directors / Lead Clinicians / Senior Managers
All Directors, Lead Clinicians and Senior Managers have responsibility for ensuring that this policy is known to their staff and that its requirements are followed by all staff within their Directorate / Division / Department.

Departmental Heads / Service Managers / Clinical Leads
Are responsible for ensuring infection control risk assessments are undertaken and that all possible measures are taken to reduce the spread of infection to patients, visitors and staff.

All managers are responsible for ensuring that staff have access to up to date training to enable them to adopt safe working practices at all times and are appropriately trained to minimise risks to themselves and others.

Medical / Nursing Staff
All medical and nursing staff are responsible for following the Blood Culture Policy and ensuring relevant documentation in the medical/nursing notes.

6. Policy Statement

The Department of Health published a best practice summary for taking blood cultures as part of the saving lives programme for reducing healthcare associated infections including MRSA in 2011. This policy reflects those recommendations.

The essential components are:

- Only take a blood culture if there is a clinical need to do so **not as routine**
- Blood cultures should be taken as soon as the clinical need is identified
- Staff are competent and ANTT trained and assessed as competent by an ANTT assessor within the organisation
- Asepsis is maintained throughout the procedure
- **Do not** take blood from those on the care of the individualised care of the dying document

7. Process

7.1 Indications for taking blood cultures

- **Only take blood for culture when there is a clinical need to do so and not as routine**
- **Blood cultures must be taken following a request by the clinical team**
- **Blood cultures should be taken as soon as possible after request. It is unacceptable to leave a request card out for a Phlebotomist to take a blood culture as that would lead to a delay in diagnosis and subsequent treatment**

Blood cultures are taken to identify patients with a bacteraemia and or fungaemia. There are many signs and symptoms in a patient which may suggest a blood stream infection and clinical judgement is required. The following indicators should be taken into account when assessing a patient for sepsis:

- Core temperature out of normal range > 38 C / < 36 C
- Abnormal heart rate (raised) >90*
- Low blood pressure Systolic BP < 90 mmHg / fall of 40 mmHg from patients normal *
- Raised respiratory rate >20 breaths per minute*

Other signs and symptoms include:

- Neutrophilia, or neutropenia (WCC > 12x10*9/l, < 4x10*9/l, Neutrophils <1x10*9/l)
- Chills with rigors; headache with stiff neck
- Focal signs of infection
- New or worsening confusion

* Parameters for adult patients only.

NB. Signs of sepsis may be minimal or absent in the very young and the elderly.

Elderly patients may be afebrile or present with low-grade fever. Changing mental status or functional status may be the only sign of bloodstream infection in elderly patients or those with end-stage renal disease. Therefore a high index of suspicion is required: where bacteraemia is suspected in these circumstances, blood cultures should be sent, irrespective of the measure core temperature.

Blood-cultures should only be collected by members of staff (medical, nursing, phlebotomists) who have been trained in the collection procedure and assessed as **competent**.

7.2 Timing of the blood culture

- Blood cultures should be taken as soon as possible after identification of likely sepsis
- Blood cultures should ideally be taken prior to the administration of antibiotics unless there is a delay in the process of obtaining blood cultures and the patient is septic, in this case antibiotics must be given as soon as possible
- **Two** sets of blood cultures taken from separate sites are recommended to increase sensitivity and allow identification of contamination
- In patients with suspected endocarditis and other endovascular infections, take 3 sets of blood cultures at different times over a 24-48hr period to document continuous bacteraemia
- If blood is being collected for other tests, always collect the blood culture first

7.3 Volume of blood for culture

There is a direct relationship between the volume of blood cultured and the diagnostic yield. The optimal volume of blood per blood-culture set is 20 ml (10ml per bottle) in adults. In paediatrics, a smaller volume is required. Recommendations are 1-2 ml of blood per set for neonates, 2–3 ml for infants and 3–5 ml for older children.

7.4 Suitable Sites

- The preferred sites are the veins of the antecubital fossa and the hand veins.
- Always make a fresh peripheral venepuncture. Do not use existing peripheral venous cannula or sites immediately above these.
- If a central line is present, paired equal volume blood cultures (one through distal port of the central line and a peripheral blood culture) should be taken simultaneously to diagnose a central line related blood stream infection (CRBSI). The central line port must be accessed only by trained and competent staff, e.g. member of the CVAD team
- If a tunnelled line is present, a sample needs to be taken from each lumen in addition to a peripheral sample
- The femoral vein must only be used as a last resort due to the risk of contamination. Only medical staff should carry this out and it should be documented
- Blood cultures should not be taken through a sinus tract or broken/infected skin as there is increased risk of contaminating the sample

7.5 Documentation

To request blood culture investigation via EPR:

- Via requests/care plans, request blood culture MCS
- Complete and sign the request
- Select specimen collection
- Print labels
- Print requisition
- After labelling the sample, and the process is complete, select collected
- All blood cultures must be **documented** in EPR, including date, time, site, ANTT practice, and indications
- The request forms should comply with the Trust labelling policy, have the relevant clinical details and be collected in accordance with the Trust "Specimen, Handling and Transportation Policy"
- The blood culture bottles should have patient identifiers and site (peripheral vs central) clearly labelled without obscuring the barcode on the bottles
- The barcodes should not be removed from the bottles, they should be left attached
- Any subsequent positive results communicated by the microbiology department should be accurately documented in EPR and advice given must be acted upon

7.6 Contamination in blood cultures

Contamination arises when organisms that are not actually present in the patient's bloodstream are grown in culture. This gives rise to a 'false positive' blood-culture.

Reports from NHS Trusts suggest that the contamination rates could be as high as 10%. At CHFT, our blood-culture contamination rate was reported as 4.39% in 2017.

7.7 Investigation of contaminated cases

- All blood culture requests must be ordered by the clinician making the request and documentation completed by the person taking the specimen.
- Where MRSA is the contaminating organism a full PIR (Post Infection Review) will be required, this will be led by the patients clinician. The person who took the blood culture will be interviewed as part of this process.
- The investigation outlined is a minimum; Divisions may set their own criteria on how to further investigate these incidents.

7.8 Repeat blood cultures

In patients with positive blood-cultures, do not send repeat blood cultures to document 'clearance' unless:

- The patient is clinically deteriorating
- The patient had a fungaemia (yeasts/fungi in blood cultures)
- The patient had a *S.aureus* bacteraemia (including MRSA)

Persistent fungaemia or *Staphylococcus aureus* bactereamia during therapy may be indicative of deep-seated or endovascular infection.

7.9 Competence

All practitioners are responsible for preventing contamination of the sample by practicing strict ANTT. Blood cultures must only be collected by a member of staff who has been trained and is competent in blood culture collection.

Equipment

Equipment required – Sealed Blood Culture Collection Pack (which contains the following:

1. BD Vacutainer blood collection set.
2. Chloraprep FREPP 1.5ml (2% Chlorahexidine Gluconate in 70% Isopropyl Alcohol) one step single use device.
3. Swabs x 2 (2% chlorahexidine gluconate in 70% isopropyl alcohol).
4. Disposable Tourniquet.
5. Blood Culture Bottles.

Other equipment required

ANTT Trolley
Apron
Gloves
Dressing

Sharps container

Procedure

See Appendix 1.

8. Training and Implementation

All staff who undertake this procedure are to be trained in Aseptic Non Touch Technique (ANTT) and be competent in using the BD vaccutainer blood collection system. This is led by the IPCT Nurse with support from key ANTT assessors throughout the organisation.

This policy will be available on the Trust Intranet and communicated through existing clinical forums and divisions.

Staff awareness will be raised during mandatory infection prevention and control training updates

9. Monitoring Compliance

Criteria	Lead	Monitoring	Frequency	Committee
Blood culture contaminants	Path Lab Manager	Surveillance data from microbiology lab	Quarterly	Reported quarterly at IPCC

10. Trust Equalities Statement

Calderdale and Huddersfield Foundation Trust aims to eliminate discrimination, harassment and victimisation and advance equality of opportunity through fostering good relationships, promoting inclusivity and embedding the “One Culture of Care” approach throughout the organisation. Stakeholder engagement is vital to analyse the equalities impact of this policy and ensure where there are any negative impacts, mitigation has been discussed and acted on.

11. References/Supporting Documents

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Saving lives: taking blood cultures. A Summary of best Practice, (Department of Health, 2007). http://webarchive.nationalarchives.gov.uk/20120118171812/http://hcai.dh.gov.uk/files/2011/03/Document_Blood_culture_FINAL_100826.pdf

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Public Health England (2014). UK Standards for Microbiology Investigations. Investigation of Blood Cultures (for Organisms other than Mycobacterium species). Available from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/372070/B_37i8.pdf

Sepsis Trust UK; http://sepsistrust.org/2018

Weinstein, M.P. (2003). Blood culture contamination: persisting problems and partial progress. Journal of Clinical Microbiology, June 2003, 2275-2278.

12. Associated Documents

- Policy for the early recognition and management of sepsis within adult acute hospital settings

- Aseptic Non-Touch Technique (ANTT) Guidelines CHFT: http://nww.cht.nhs.uk/divisions/diagnostic-and-therapeutic/infection-prevention-control-news/aseptic-non-touch-technique/

- Antibiotic Guidelines CHFT: http://nww.cht.nhs.uk/divisions/diagnostic-and-therapeutic/pathology/microbiology/antibiotic-guidelines/

APPENDIX 1

Procedure for taking blood cultures

Ensure that all steps are in accordance with ANTT guidelines

Preparation Zone

- Decontaminate hands, prepare and collect equipment, inspect blood culture bottles, and check expiry dates
- Put on an apron in readiness of the procedure

Patient Zone

- Clean any visibly soiled skin on the patient with soap and water then dry
- Apply a disposable tourniquet and palpate to identify vein, release the tourniquet
- Decontaminate hands and apply gloves
- Clean skin with a 2% chlorhexidine in 70% isopropyl alcohol impregnated applicator (Chloraprep/FREPP) for 30 seconds and allow to dry for 30 seconds
- 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 for 30 seconds and allow to dry for 30 seconds. **A central line port must be accessed only by trained and competent staff, e.g. member of the CVAD team**
- Wash and dry your hands again or use alcohol hand rub and apply clean examination gloves (sterile gloves should not be necessary if key parts and sites are not touched)
- Insert needle into prepared site. Do not palpate again after cleaning
- Place adapter barrel over the blood collection bottle and pierce the septum, aerobic bottle first
- Hold bottle upright and below the level of the collection site. Use bottle graduation lines to accurately gauge sample volume and collect sample
- If blood is being collected for other tests, always collect the blood culture first
- Cover the puncture site with an appropriate dressing
- Discard winged blood collection set in a sharps container
- Decontaminate hands after removing gloves
- Label bottles with appropriate patient information. Ensure that barcodes on the bottles are not covered by additional labels and that any tear-off barcode labels are not removed

Decontamination Zone

- Clean equipment and dispose of waste as per Trust guidelines
- Decontaminate hands
- Record the procedure with indication for culture, time, site of venepuncture, ANTT compliance and any complications in the patient's EPR record