NHS
Gloucestershire Hospitals
NHS Foundation Trust


# ADULT PERIPHERAL BLOOD CULTURE SAMPLING

## PRE-COURSE MATERIAL

# Contents

## Introduction

This pre-course learning pack is designed to prepare authorized health practitioners where it is appropriate to acquire the knowledge and skills required to perform peripheral Blood Culture sampling safely. This is in accordance with; best practice evidence and is based on Blood Culture Sampling Policy", GHNHSFT policy, Public Health England (2019) national standards and Becton Dickinson (BD) and Bact T Alert company recommendations and guidelines and Pathology Dept. order of draw (OOD) guidelines.

**IV Access Requirements:** If it is appropriate for your clinical practice and area that you need to take Blood Cultures from an IV access device e.g., a central venous catheter, you must be competent in peripheral Blood Culture sampling and complete all pre-requisites required for central access sampling learning and complete the required competency.

**Please visit the Clinical Skills and Pathology website for resources and information:**

intranet.gloshospitals.nhs.uk/hr-training/training-development/clinical-skills/

gloshospitals.nhs.uk/our-services/services-we-offer/pathology/information-service-users/blood-tube-guides/

## Objectives for Peripheral Blood Culture sampling

- Understand why Blood Cultures are performed and when they are clinically indicated
- Understand your role and responsibilities with regard to taking Blood Cultures and acting on the results

**Provide clear procedural guidance to ensure:**

- Consistent Aseptic Non-Touch Technique (ANTT®) is followed when Blood Cultures are taken to minimise the risk of the Blood Culture being contaminated (which can result in misdiagnosis and incorrect treatment)
- Genuine bacteraemic infections are accurately diagnosed
- The microbiological cause of Sepsis is diagnosed as frequently as possible
- Patients are identified with a bacteraemia/Sepsis
- Clinicians are mindful that signs of Sepsis may be diminished /absent in the elderly, the young and those with compromised immune systems
- There is a low threshold for performing Blood Cultures in children/neonates and those with unexplained deterioration

## What are Blood Cultures?

- Performed to detect presence of micro-organisms in the bloodstream. The culture of micro-organisms from blood is essential for microbiological diagnosis of bacteraemia, fungaemia, infective endocarditis and conditions associated with a clinical presentation of pyrexia of unknown origin (PUO)
- A Blood Culture is a sample of blood taken aseptically from the bloodstream which is cultured in a liquid culture medium so that viable micro-organisms can be detected, identified and have antimicrobial sensitivities performed on them
- The results are used to diagnose a range of serious infections that give rise to blood stream infections
- Bloodstream infections are some of the most serious infections in clinical practice – many of the bloodstream infections arise from an original source (or site) of infection e.g., pneumonia, bacterial meningitis, uroSepsis, central line infection or other serious infection
- The results of significant Blood Cultures are used to ensure bloodstream infections are treated with the optimal antibiotics and to ensure serious infections are diagnosed as accurately as possible

## Consent

To practice legally practitioners must gain consent, which is freely given where possible, from the patient. Inability to make decisions or give consent may be due to a number of reasons and may be transient or permanent; for example, illness or a reduced conscious level, learning disability, reduced mental capacity due to dementia or mental health issues, speech problems or language differences. In these situations, practitioners must always act in the patient's best interest and be aware of the guidance outlined in the Mental Capacity Act (DoH 2005).

Blood Cultures requires verbal consent and for consent to be legally valid, the patient must be suitably informed about what the procedure entails and understand any implications of the procedure and any treatment. It is recommended that gained informed consent is documented if possible, in case of any complaint made.

**Other important considerations:**

GHNHSFT recommends that blood sampling should be expected to be successful after one attempt. If you are unsure of success at any time, assistance must be sought from more experienced practitioners and no more than two attempts must be made.

**Please see UK Vessel Health and Preservation guidelines and video link here and the Clinical Skills website:**

ips.uk.net/vessel-health-and-preservation-framework-2020

The use of a topical, local anaesthetic is not routinely used for Blood Cultures, unless when sampling from someone who has a needle phobia. The local topical anaesthetic must be prescribed or administered under a PGD and consideration of its use must be patient centred.

Sampling from children will be carried out by Paediatric specialists and is performed using one culture bottle which is coloured yellow.

## Ordering Blood Sample Requests

Blood culture samples will be requested via EPR or written on paper forms for patients who after assessment have a high suspicion of suspected or proven infection and whose condition has deteriorated with an unexplained cause. See list of clinical indicators below.

## Clinical Indicators

- Signs of infection (suspected or proven)
- A core temperature out of normal baseline range (low or high)
- Chills/rigors present
- Change in baseline mental state
- Acute deterioration in functional ability
- Raised respiratory rate
- Oxygen is required to maintain saturations to a prescribed level
- Reduced peripheral perfusion, prolonged capillary refill time and presence of cyanosis
- Rash, mottling or ashen appearance
- Raised heart rate
- Low blood pressure
- Significantly reduced urine output
- Blood lactate of 2mmol/L or more
- Abnormal white blood cell count (low or high)
- Patient is immunocompromised
- Chemotherapy has been administered in the last 6 weeks
- Trauma, surgery or procedure has taken place in the last 6 weeks

**If a patient has an acute rise in NEWS2 but is apyrexial, they could still be Septic and Blood Cultures are still clinically indicated despite them being afebrile.**

NB: Ensure sample is appropriate and required

## Blood Forms and EPR Requests

*For clinic areas*

*For most other clinical areas*


The requesting clinician must complete the correct blood test request form either on paper or EPR (examples shown here). Most areas in GHNHSFT use Sunrise electronic patient records (EPR) system and request, collection and results are all tracked and recorded in this system. Clinic areas will access and document sample requests via paper forms. Note- However it is highly unlikely that patients will require blood culture sampling in a clinic setting.

**All samples must include the minimum data sets and be in accordance with:**

- Pathology policy to prevent potential error in; patient identification, sampling, diagnosis and treatment. The sampler must check the completed blood form is correct and if there is any doubt must check with the requesting clinician
- In general, inadequately labelled samples will not be processed and a repeat sample and request will be required
- When collecting the blood form, the sampler must check that the paper form or EPR details are correct; name, DOB and first line of their address. Informed verbal consent must then be gained and a vein assessment made.

## Data Set for All Samples

- Surname
- Forename in full
- Unique identity number such as MRN, NHS or Major Incident (MI)
- Date of birth (not age)
- Date of sample
- Signature of person taking blood
- Name and bleep of clinician requesting the test (or contact number if bleep not relevant)
- Clinical details

## Unidentified Patients

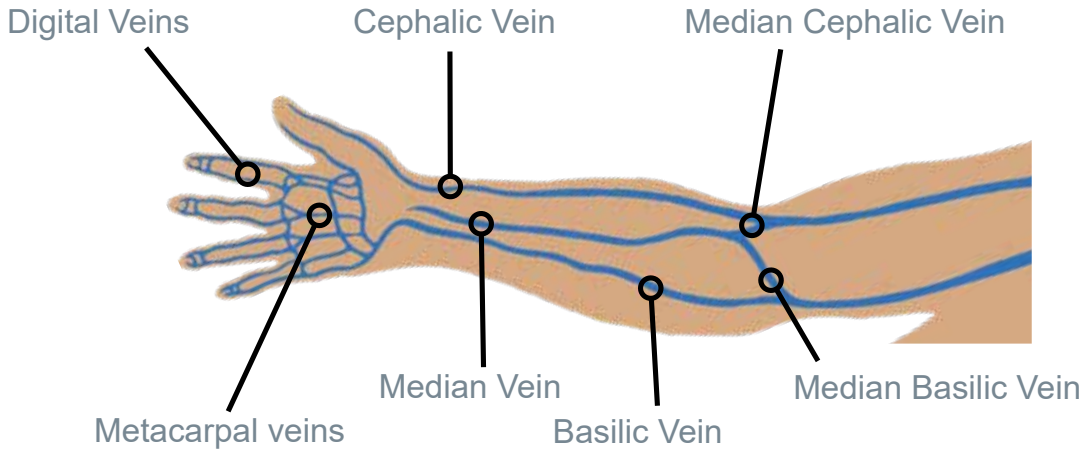
For unidentifiable patients- a unique Major Incident (MI) number will be generated and used until the patient is identified- see Pathology policy action card BTR2. For unknown patients the following minimum data set is required; Unique number, e.g. MI number, Approximate age, Gender, then as above.

## Selecting a Site for Venepuncture

In order to correctly identify a vein against an artery for sampling, careful palpation and identification must be made. Access veins according to UK vessel health and preservation 2020 guidelines.

See Venepuncture resource booklet on the Clinical Skills website for further guidance on vein suitability, identification and methods to improve venous access if required.

Also see Clinical Skills website for information on difficult intravenous access (DIVA) patients where the use of Accu Vein viewers or Ultrasound devices is indicated.




## For Blood Culture Sampling Assessment

| Grade | Vein Quality | Definition of Vein Quality | Insertion Management |
|---|---|---|---|
| 1 | **Excellent** | 4-5 palpable or visible veins suitable for venepuncture | Culture sampling may be performed by trained authorised health care practitioner |
| 2 | **Good** | 2-3 palpable or visible veins suitable for venepuncture | Culture sampling may be performed by trained authorised health care practitioner |
| 3 | **Fair** | 1-2 palpable or visible veins suitable for venepuncture (Veins may be small, scarred or difficult to find and require heat pads, infrared viewer or unltrasound to aid vasodilation) | Culture sampling may be performed by trainied authorised health care practitioner with the assistance of viewing aids |
| 4 | **Poor** | Veins not palpable or visible (requires ultrasound or infrared viewer assistance) | Culture sampling may be performed by expert trained authorised health care practitioner with the assistance of viewing aids |
| 5 | **None** | No veins palpable or visible to naked eye or viewing aids | Not suitable for Culture sampling. Refer to an expert practitioner for access advice |

# Blood Culture Sampling

Blood Cultures are taken as the first samples in the sampling order of draw (OOD) guidelines.

**See guidelines:**

gloshospitals.nhs.uk/our-services/services-we-offer/pathology/information-service-users/blood-tube-guides/

There are many factors that contribute to accurate test results (Pre-Analytical).

**The variable factors can be divided into three areas:**

1. During the preparation of the patient and equipment prior to Blood Culture sampling
2. During the sampling process
3. Handling and transportation of the sample

## Preparation

**1. During the preparation of the patient and the equipment prior to sampling:**

- **Patient misidentification -** patients must be asked to verbally confirm their name, DOB and first line of their address and this must correlate with the microbiology request form
- **Incorrect form used/incorrect form for patient -** the Trust have a variety of request details for sampling- please ensure Microbiology request forms are completed. They must be completed correctly and match the identification markers of the patient to ensure patient safety and correct treatment
- **Incorrect timing of the sample-** Blood Cultures are performed at the correct time and in a timely fashion and only when clinically indicated. Ideally at the height of the fever (or as soon as possible after this). Blood Cultures should be taken after identification of possible bacteraemia / Sepsis and usually before antimicrobial therapies are commenced
- **Incorrect timing of the sample-** If the patient is already on antibiotics and is not responding to treatment (still febrile), it is appropriate to perform Blood Cultures ideally taken just before the next due dose

**2. During the Sampling Procedure:**

- **Incorrect order and selection of culture bottles-** If you are taking multiple tubes for a range of pathology investigations, always fill the Blood Culture bottles first to avoid contamination from other blood tubes' additives with the culture medium
- **Incorrect filling order of aerobic and anaerobic bottle.** Always fill the aerobic bottle first on culture sampling using a Safety Butterfly device
- **Underfilling of the culture bottles-** minimum fill is 5mL and maximum fill is 10mL against the bottle graduation markings. In some instances e.g... emergency- it may not be possible for the patient to confirm this. Please ensure all other checks are made to confirm the patient identity.

- **Timing of Blood Cultures-** must be taken at the height of a fever or as soon as possible after they are identified as being clinically indicated
- **For suspected Sepsis-** samples must be collected within one hour of Sepsis being recognized
- **Frequency of sampling-** two sets of Blood Cultures should be taken consecutively as one episode from different sites- to maximise the chance of detection of the bacteraemia This also minimises the risk of contaminated samples being interpreted as positive Blood Cultures if only one set had been taken (Public Health England - 2019)
- **Contamination due to poor ANTT-** Understanding and employing aseptic non touch technique (ANTT ®) before and during the procedure ensures the sample result can be relied upon and achieves national infection reduction targets

**3. Handling and Transportation of the Samples:**

- Samples should be transported and processed as soon as possible
- Keep the barcode on the bottles. The barcode is linked to a specimen number and the patient's demographic details (name, DOB, hospital number)
- The Blood Culture sample sets must be loaded onto the Blood Culture as soon as possible and ideally within 4 hours maximum
- The samples are scanned on the bottle barcodes, and incubated at 37ºC

## Blood Culture Process in the Micro-Biology Laboratory

- Positive Blood Cultures produce CO2 which is detected by the Blood Culture machine alerting the scientist when the Blood Culture is "positive". The bottle is taken off and tested by other means to determine which micro-organism is present in the bottle
- These tests include Gram stain, subculture and may also include antibiotic sensitivity tests if the isolated micro-organism is clinically significant
- Blood Cultures are routinely cultured for five days
- Gram stain is performed to indicate broadly what organism is in the Blood Culture. Identification and antibiotic sensitivity tests are performed when the micro-organism has been successfully sub-cultured
- Identification results are usually available 1-2 days after the Blood Culture becomes positive
- The Microbiologist reviews the results and liaises with the clinical team to discuss and assess the significance of the results in the context of the clinical picture – they will decide if the results have any implications for the ongoing management of the patient (antibiotic treatment, additional investigations and interventions)

## Blood Culture Contamination

Blood Culture contamination results in Blood Cultures becoming "positive" and yielding micro-organisms that were not present in the bloodstream at the time the Blood Culture was collected from the patient. The risk of contamination can be minimised by good sample collection technique and by only taking Blood Cultures when the patient is likely to have a bloodstream infection.

## Avoiding Contamination

**To avoid contamination follow this guidance:**

- Use Aseptic Non-Touch Technique (ANTT®)
- Use standard (infection control) precautions
- Use local standard policy and online Blood Culture sampling resources
- Risk assess if you need a second practitioner to assist when taking Blood Cultures

## Origins of Blood Culture Contaminants

- The micro-organisms most often seen causing Blood Culture contamination are those that are found as members of the normal (commensal) skin flora
- Blood culture bottle manufacturer (unlikely)
- Environment including from the tops of other blood tubes sent for Pathology testing
- Skin of the patient
- Skin of the person taking the Blood Culture

In some circumstances, Blood Culture contaminants can be genuine pathogens when isolated from Blood Cultures of patients who have infected prosthetic devices (e.g. central lines, prosthetic heart valves, arterial grafts and permanent pacemakers). If these organisms are grown from Blood Cultures, check that the patient does not have a prosthetic device before dismissing the result as indicating contamination. The uncertain significance of skin organisms in Blood Cultures can be clarified by taking repeat Blood Cultures (aseptically).

**Potential consequences of Blood Culture contamination:**

- Diagnostic confusion – incorrect or unnecessary antibiotics may be given and unnecessary investigations may be performed
- There may be a need to repeat investigations (e.g. Blood Cultures) to clarify
- Organisational consequences – need to perform incident investigations, breach of infection reduction targets (with possible penalties)

## Blood Culture Sampling - Standard ANTT Approach

**Blood Culture Standard Approach ANTT Guideline poster:**

intranet.gloshospitals.nhs.uk/documents/5273/Peripheral_Blood_Cultures_Export.pdf

The ANTT 6 actions approach: Will be discussed further within your training.

## Infection Control Issues

Patients have a right to be protected from preventable infections and practitioners' have a duty to safeguard the well-being of their patients.

The microbiological aim of aseptic non touch technique (ANTT®) is **asepsis**.

Effective hand hygiene is the most important component of good infection prevention and control as hands are a common route of transmission of infection. Transient bacteria can be removed by effective hand hygiene techniques.

Blood Culture sampling is a clinically invasive procedure and must be performed using ANTT® principles (www.ant.org.uk)

**The main causes of contamination come from:**

1. Airborne contamination
2. Hand touch contamination
3. Other touch contamination (e.g. equipment, work surfaces)

# Indications

- Blood Cultures should only be performed when there is a clinical need to do so (Public Health England, 2019)
- To identify patients with a bacteraemia/Sepsis
- Clinicians must be mindful that signs of Sepsis may be diminished /absent in the elderly, the young and those with compromised immune systems
- There is a low threshold for performing Blood Cultures in children/neonates and those with unexplained deterioration

**Examples of focal infections that result in bacteraemia:**

- Pneumonia
- Severe/complicated upper urinary tract infection
- Peritonitis / intra-abdominal Sepsis
- Bacterial meningitis
- Septic arthritis
- Osteomyelitis
- Moderate to severe cellulitis
- Necrotising fasciitis
- Endocarditis
- Deep abscess

## Frequency of Blood Cultures

- When Blood Cultures are indicated, **two sets of Blood Cultures** should be taken at the same time from different sites. For **Paediatric/Neonates** - take a **single aerobic bottle** or **low volume bottle**
- This is to maximise the chance of detection of the bacteraemia and to minimise the risk of not being able to interpret the significance of positive Blood Cultures that might be due to contamination (if only one set had been taken)
- If the patient is suspected to have **endocarditis**, the minimum number of Blood Cultures sets taken is **three**, in the first 24 hours

## Standard Precautions (PPE)

**The standard precautions are detailed below:**

**Handwashing**
NHS England guidelines

**Non Sterile Gloves**

**Disposable Apron**

## Procedure Equipment - Standard Approach

**For Standard ANTT® Approach:**

- Plastic procedure tray or cleaned surface and sharps container
- Universal cleaning and disinfecting wipes to clean tray/surface e.g. Gratnell or dressing trolley
- Non sterile Nitrile gloves and disposable plastic apron
- Extra appropriate PPE for Covid-19/infectious patients
- Goggles (if risk of blood splatter)
- Sterile Vacutainer Safety Lok Blood Collection set (Butterfly needle) and Transfer holder (if not integrated with the needle)
- BacT/Alert® Blood Culture bottles (correct number)
- Chlorhexidine 2% & Alcohol 70% wipe (x3 for x1 sample set = 1 aerobic and 1 anaerobic bottle)
- Disposable once only use tourniquet
- Sterile gauze/hypoallergenic tape for dressing or failed attempt

**For Surgical ANTT® Approach:**
(maintain Surgical Approach throughout- see Cannulation Surgical ANTT® Approach for guidance).

- Cleaned dressing trolley
- Sterile pack
- Sterile gloves

## Blood Culture Bottles


**ADULTS**
Aerobic/Anaerobic
( x1 set )


**CHILDREN**
Single Paediatric Bottle

## Preparation

- Establish patient identity
- Ask the patient to give you their name and date of birth if able.
  **Do not ask them to confirm what you say**
- Obtain verbal informed consent to take any blood samples for pathology testing. If it is not possible to obtain verbal consent consider the Mental Capacity Act - best interests of the patient
- Aim to perform the procedure uninterupted to avoid potential errors

## Documentation

- All relevant clinical details should be recorded on the Microbiology request form including recent travel history. List the symptoms the patient has and any suspected site of infection. Information about recent, current and intended antibiotic treatment should be included
- Labelling must be in accordance with pathology specimen labelling policy (minimum data set)
- Write the full name (forename and surname), and either the date of birth or the MRN of the patient on each of the Blood Culture bottles - do this after the Blood Cultures have been taken. Do not label Blood Culture bottles with an addressograph label - this might obscure the bar code labels on the Blood Culture bottles
- Details on the form and the bottles must match and comply with the pathology specimen labelling policy
- On the request form supply, patient location (current ward), consultant, name of person who ordered / requested the Blood Cultures – supply a legible name for the "requester" and contact details e.g. bleep number (For EPR requests certain details e.g. bleep/contact details are mandatory fields)

## Peripheral Blood Cultures Procedure

**The Standard ANTT® Approach is shown below:** (risk assess if Surgical ANTT® Approach is required- see example in Cannulation ANTT® poster guidelines).

Blood Culture sampling must be an uninterrupted procedure to avoid errors. Often other blood samples will be taken after Blood Cultures and the order of draw and other important guidelines must be followed to ensure the results can be relied upon e.g., wrong blood in tube (WBIT), tourniquet time.

| Preparation | Preparation Zone | |
|---|---|---|
| 1. Ask patient to confirm their identity and gain informed verbal consent | 2. Wash hands according to best practice (NHS England) guidelines and gather required equipment | 3. Ensure that all conditions for Blood Culture sampling have been met - e.g., timing/number of sets/antibiotics |

4. Position arm e.g., on pillow and use methods to raise the vein e.g., heat and tourniquet

5. Assess/identify for suitable veins (according to UK Vessel Health and Preservation vein assessment tool) and check if needle phobic/requires local topical anaesthetic

6. Complete vessel health preservation (VHP) assessment

7. Wash hands and clean plastic tray and allow to air dry

8. Gather all appropriate Blood Culture sampling equipment, checking for expiry dates and integrity and place in tray

## Patient Zone

9. Clean hands with sanitising gel/foam and put on apron and gloves

10. Ensure the following preparation is carried out at the bedside on a suitable cleaned work surface/tray- not the patient's bed

11. Perform hand hygiene, put on an apron and remove dust caps from the culture bottles

12. Re-wash hands or use alcohol disinfection gel and disinfect tops of Blood Culture bottles with a new 2% chlorhexidine/70% alcohol swab for 20 seconds and allow to air dry

13. Perform hand hygiene and put on gloves

14. Apply disposable tourniquet 8-10 cms above the intended puncture site and re-identify vein

15. (The tourniquet should only be applied for a maximum of 2 minutes (optimal 1 minute) before other blood samples. This is to avoid artificially elevating blood sample results

16. Re-palpate to identify and assess vein for sampling

17. Cleanse site with 2% chlorhexidine/70% alcohol swab in a circular outward motion up to 10cms for 20 seconds. Allow to air dry. Do not re-palpate site

18. Attach a winged Safety-Lok blood collection set to the BacT/ALERT adapter cap (If not integral)

## Patient Zone - Continued

19. Insert needle into prepared site. Can secure needle with hypo-allergenic tape if needed (e.g., over each wing-avoiding insertion site) Do not re-palpate cleaned site

20. Fill aerobic bottle first (blue). Place adapter cap over bottle and pierce septum.Hold Blood Culture bottle upright but below the level of the needle

21. Use graduation markings to gauge sample volume (minimum volume 5 mL and optimal volume 10mL)


22. Loosen tourniquet if able

23. Fill anaerobic bottle (red/maroon) and remove

24. Take other blood samples now as indicated, following correct order of draw and mix times

25. With one hand remove tape and safety needle and immediately activate safety mechanism and dispose of the whole unit into the Sharp's container. At the same time with the other hand - apply pressure to site for 3-5 minutes with gauze, or until visible bleeding has stopped.
There is no need to invert/mix the sample bottle

26. Cover site with plaster/ dressing

## Decontamination Zone

27. Dispose of equipment in accordance with Waste Policy

30. Send all Blood Culture sets to Pathology Reception as soon as possible. The sooner the Blood Culture bottles are loaded onto the Blood Culture machine, the sooner the bacteraemia can be confirmed in the Laboratory

28. Remove PPE and perform hand hygiene as per NHS England guidelines

29. At the patient's bedside immediately complete sample labelling according to minimum data set on EPR and document procedure and indications in medical notes/EPR as relevant

31. Document procedure and indications

## Following Up Results of The Investigations

All investigations should be followed up by the “requester” (clinician or clinical team that requested the tests). If the patient has been transferred to a different clinician or clinical team, it is the current team’s responsibility to check the results of the Blood Cultures and to act accordingly to any significant findings. If the Blood Cultures are positive, the significance of the results should be interpreted and the implications for any current and ongoing antimicrobial treatment considered.

Significant positive Blood Cultures indicating a genuine bacteraemic infection usually require refinement and optimisation of antibiotic treatment. They should also trigger the clinical team to assess for the source (focus of infection) of the Bacteraemia - this may require additional investigations and interventions (“source control”) to be undertaken. The Microbiologists are always happy to discuss the results of patients who have positive Blood Cultures with the responsible clinician.

**Refer to GHNHSFT ‘Antibiotics Guidelines’ and discuss with Consultant Microbiologist if further advice is required.**

## Sample Contamination

Adherence to recommended procedure/policy is essential to avoid sample contamination with micro-organisms derived from the patient’s skin, from the practitioner or the environment.

**Blood Culture contamination can result in:**

- Diagnostic confusion
- Potential for patient to receive unnecessary or inappropriate antibiotics
- Additional work for the clinical teams and the Consultant Microbiologists
- The microbiological cause of Sepsis is diagnosed as frequently as possible
- Additional work for the Microbiology laboratory processing the contaminated positive Blood Cultures
- Failure to achieve HCAI Bacteraemia targets
  (financial penalties and increased performance monitoring)
- Extra work for staff completing root cause analysis procedures for infections that have not actually occurred

## Summary



This resource material should help prepare you for your eLearning and quiz before your face-to-face training and/or provide verification and updated knowledge for already competent practitioners in this skill.

**If you have any queries concerning this skill after attendance at the training session, please do not hesitate to contact us on:**

**0300 422 5667**

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