



Gloucestershire Hospitals  
NHS Foundation Trust

# ADULT PERIPHERAL VENEPUNCTURE

PRE-COURSE MATERIAL

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## Introduction

This pre-course learning pack is designed to prepare health practitioners' to acquire the knowledge and skills required to perform peripheral venepuncture safely, in accordance with best practice evidence and is based on GHNHSFT policy, protocols, national standards and Becton Dickenson (BD) company recommendations for practice.

Please note that the Trust has been using Becton Dickenson (BD) products since 2014 and you will receive BD handouts in the training session to supplement your learning. Please access the Hospital Intranet Pathology website and the public Pathology website on <https://www.gloshospitals.nhs.uk/our-services> to view information on blood sampling and guidelines.

## 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).

Venepuncture 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 venepuncture 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

The use of a topical, local anaesthetic is not routinely used for venepuncture, unless when sampling from a child, or someone who has a needle phobia. The anaesthetic must be prescribed or administered under a PGD and consideration of its use must be patient centred. Please follow your area protocol and competency attainment process if this is required.

## Ordering Blood Sample Requests

### Blood sampling indications

- Establishing baseline for comparison e.g. pre/post-surgery/drug treatment
- Diagnosing condition / illness
- Monitoring drug treatment to ensure levels are therapeutic

NB: Ensure sample is appropriate and required

### Blood Forms and EPR Requests

The requesting clinician must complete the correct blood test request form (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 (with the exception of Blood Transfusion requests which are currently paper).

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 the details are correct against the patient name band and request the patient confirms their identity by verbally confirming their; 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.

## Added Data Requirements and Notes for Blood Transfusion

- Full patient clinical history - "pre-op" not acceptable
- If female- obstetric history
- Any special requirements e.g. irradiated blood
- Minimum data must be accurate
- Printed addressographs labels are **NOT** to be placed on the specimens, but it is best practice to place on request forms
- Specimens where patient data has been crossed out or altered will not be accepted
- Unlabeled, wrongly or inadequately labelled specimens will not be accepted
- No specimen is considered unrepeatable

## Trust Two Separate Sampling Process

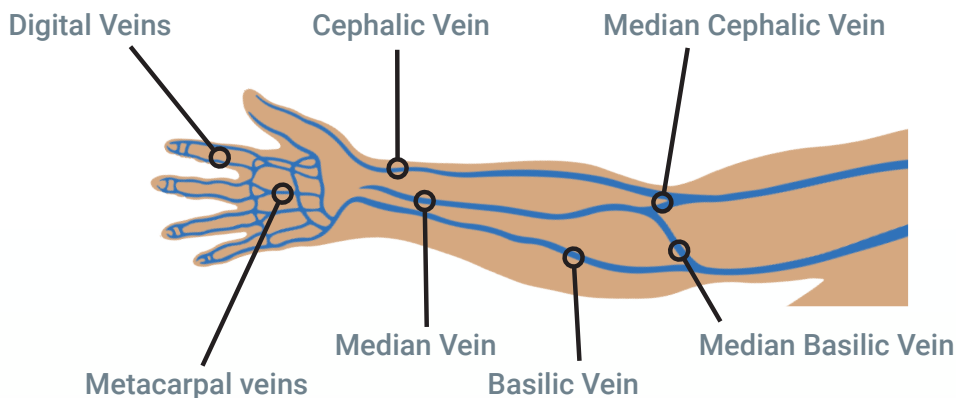
For Patient's with no historical blood group record on the computer system, in order for ABO specific blood to be issued:

**Two blood grouping samples are required** - each taken as separate phlebotomy events. Ideally the two samples should be taken by two separate people. If both samples are taken by the same person, there must be a minimum of ten minutes between the two phlebotomy events. On the next occasion this patient needs blood transfusion sampling; only one sample will be required.

**In the Community** - the report/results from the first sample will inform the GP if they need another sample at a later time. Normally the IV therapy team will organise samples and they are fully aware of the usual process. Antenatal patients will only ever have one sample sent, as blood isn't required.

## Selecting a site for Venepuncture

In order to correctly identify a vein against an artery for sampling, careful palpation and identification must be made.



### Selection criteria for choosing suitable veins:

- Use robust, visible, palpable veins e.g. antecubital fossa (ACF)
- Use veins that feel soft and resilient/ use large veins where possible
- Use a straight vein (avoid valves)
- Use veins on patient's non-dominant limb

NB: Needle and holder system needle is too large for sampling from hands - use Safety Lok Butterfly system for hand area veins

## Arteries

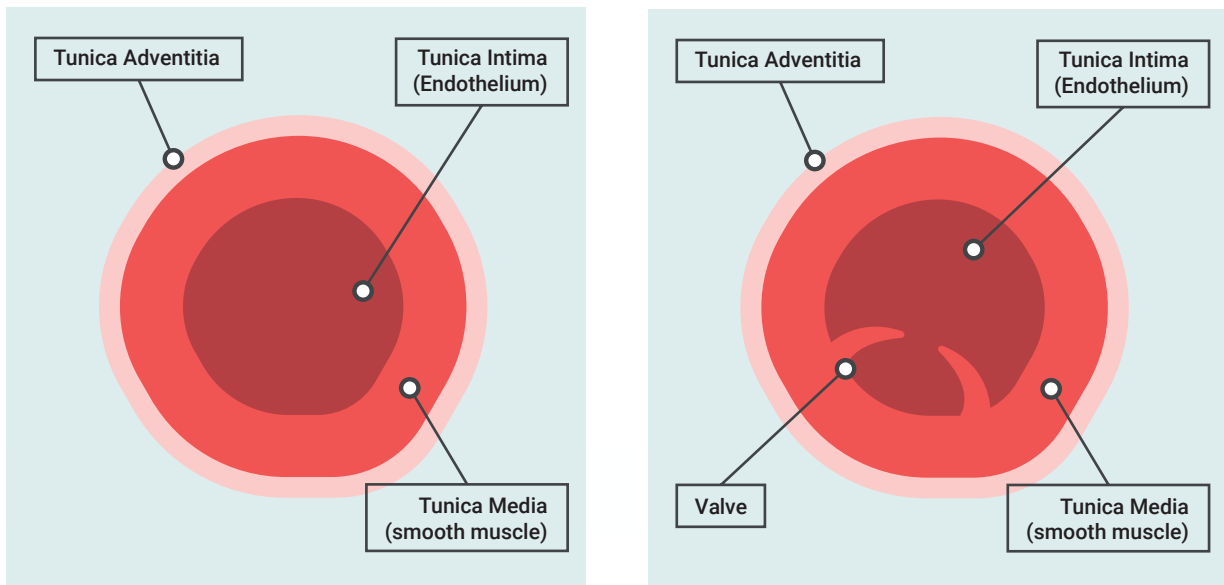
The arteries must cope with a pulsatile flow of oxygenated blood and high pressure, particularly as it leaves the heart. As a result arteries have thick muscular walls within the tunica media. The muscles of the artery wall can contract or relax under the influence of nervous or chemical stimuli and temperature, which in turn will have a direct effect on a patient's blood pressure.

## Veins

De-oxygenated blood returning from the capillaries to the veins is under low pressure and so veins do not have the thick muscular walls as seen in arteries. The veins do have capacity to pool excess blood if required, but do not have such a direct influence on blood pressure. Instead, to allow blood return to the heart, often against gravity, the veins are equipped with a series of one-way valves; crescent shaped folds of endothelium formed from the tunica intima and appear as small bulges along the veins on the skin's surface. These valves prevent blood from flowing back and pooling in the lower part of the body.

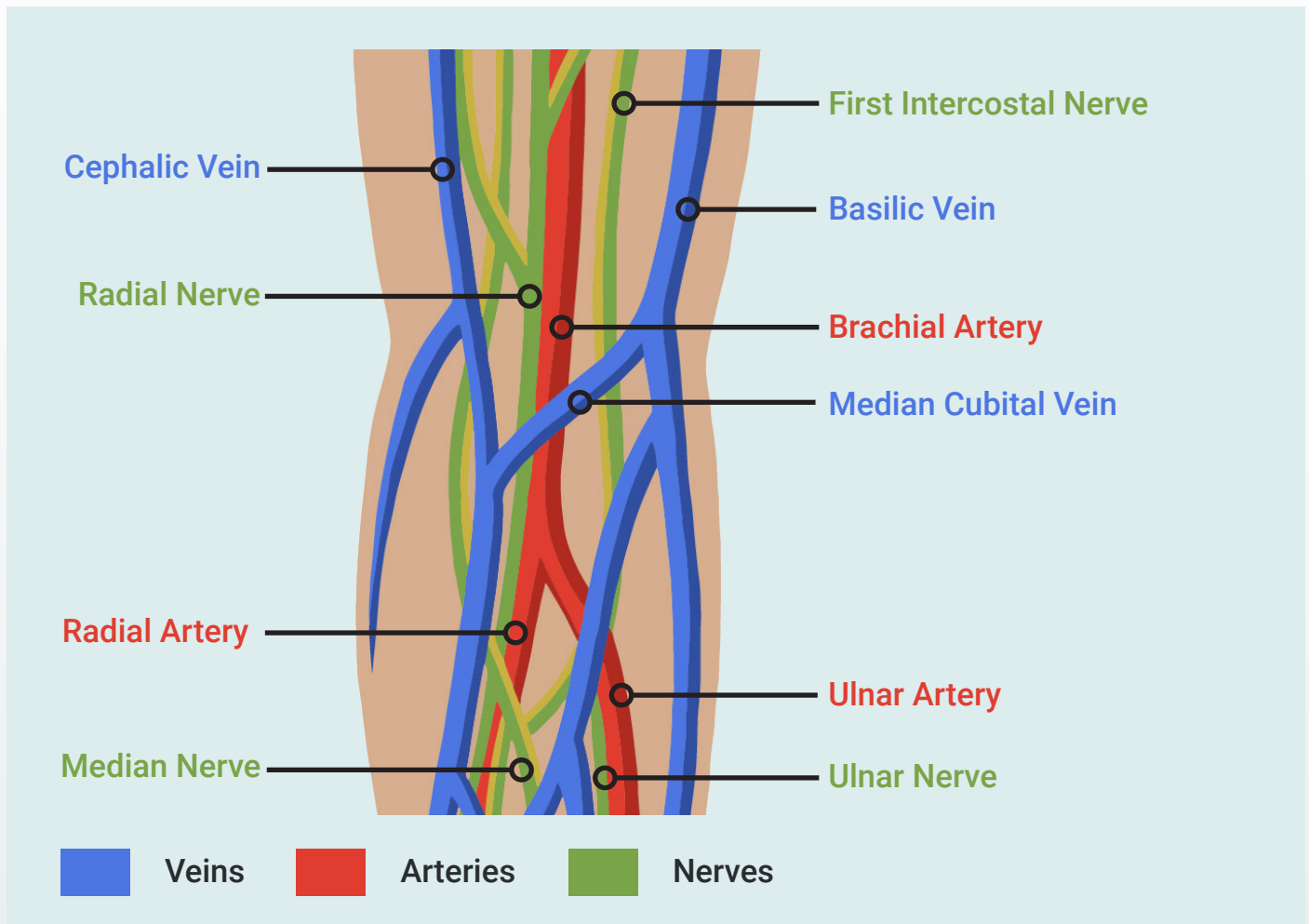
The valves are always found intimately located to muscle groups and as these muscle groups contract and relax, they push against the veins and propel blood along the vein. As a result the veins do not pulsate, an important point of differentiation when identifying a suitable vessel for venepuncture. Veins have less muscle in the tunica media but can still contract and relax when stimulated. Heat, for example, will dilate the veins allowing for easier identification and insertion of a needle. The outer tunica adventitia consists of areolar connective tissue which surrounds and supports the vessel.

## Blood Vessels



- The **Tunica Adventitia** (*outer layer*) is a fibrous layer of connective tissue, collagen and nerve fibres which surrounds and supports the vessel.
- The **Tunica Media** (*middle layer*) is a muscle layer containing elastic tissue and smooth muscle fibres
- The **Tunica Intima** (*inner layer*) is a thin layer of endothelium which facilitates blood flow and prevents adherence of blood cells to the vessel wall. Trauma to the endothelium encourages platelet adherence and thrombus formation.

## Antecubital Fossa



## Improving Venous access

### Avoid veins that are:

- Hard and sclerosed
- Damaged from previous venepuncture
- Small, visible but impalpable
- Close to existing wounds/injuries - due to infection and false results
- Near recent surgery site - due to infection and false results
- On same side as IV – stop IV for 15-20 minutes before sampling - to ensure accurate results
- If site is oedematous from stroke or post-surgery e.g. mastectomy (with lymph node clearance) - cellulitis risk
- In any area where an arterial venous (AV) fistula is present or planned to be as a permanent site for renal dialysis access risk of cellulitis and device failure
- Lower limb and foot veins- as increased risk of venous thromboembolism due to restriction of blood flow and reduced patient mobility
- Close to arteries - risk of arterial puncture
- In areas of bruising / haematoma will artificially affect blood results

### Vein identification and access will be improved with the following:

- Tourniquet - application promotes venous distension. It should be applied 8-10 cms above the intended insertion site and be tight enough to impede venous return, but not tight enough to occlude arterial flow. Allow time for the veins to fill and it should not be left on for longer than one minute before puncture as it may interfere with blood results and may lead to bruising.
- **Maximum tourniquet time is two minutes.** Use once only use Trust approved disposable tourniquet which will be discussed further in the training session
- Warmth - will dilate veins and improve visibility- heat pads may be an option
- Gravity - will help to pool blood to increase visibility and volume
- Stroke - vein to help with dilation- don't tap the vein as may be painful and result in a haematoma
- Viewing aids - e.g. ultrasound
- Clenching or pumping of hand is to be avoided as this can artificially increase electrolyte and haemoglobin levels

## Peripheral Vein Assessment Tool (Referenced from UK Vessel Health and Preservation Decision Tool 2020)

Grade	Vein Quality	Definition of Vein Quality	Insertion Management
1	Excellent	4-5 palpable or visible veins suitable for venepuncture	Venepuncture may be performed by trained authorised health care practitioner
2	Good	2-3 palpable or visible veins suitable for venepuncture	Venepuncture 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 ultrasound to aid vasodilation)	Venepuncture may be performed by trained authorised health care practitioner with the assistance of viewing aids
4	Poor	Veins not palpable or visible (requires ultrasound or infrared viewer assistance)	Venepuncture 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 peripheral venepuncture sampling. Refer to an expert practitioner for access advice








## Blood Test Tube Guide - Order of Draw

Each tube is specific to the test you are taking. They contain different additives which keep the blood stable for each test. Using the wrong tube in the wrong order may result in inaccurate test results and the need to re-draw. You will need to refer to the complete Trust Order of Draw Sample guideline and apply it to the common blood tests you will be taking. Shown here are some of the most common blood samples in the correct order of draw. Take some time to familiarise yourself with the rust and purple bottles, which are numbered to denote that separate blood tubes are required for certain tests.

### GHHNHSFT - Common examples

Please refer to Pathology website for up to date process and information and blood test order of draw guides. (In the Community - the Rust tube is replaced by narrow gold)

Cap Colour	Additive	Some Examples	Special Instructions
	Sodium Citrate	INR, APTT ratio, thrombophilia screen, coagulation studies	Must be filled at least to the minimum fill indicator - short samples will not be processed
	Clotting Accelerator & separation gel	1. General chemical pathology e.g. U&Es 2. B12, folate, glandular fever 3. Immunology tests, allergy	Separate samples required for samples from different groups (1,2 and 3)
	EDTA	1.FBC, viscosity,malaria, 2. Haemoglobinopathy screen*, DAT (Coombs)* 3. PTH*, HbA1c*, Lead 4. Meningococcal PCR* 5. Hep C viral load**, HepB PCR**	Separate samples as above for 1, 2, 3, 4 & 5). * requires separate sample tubes ** Requires 2 tubes
	EDTA Crossmatch	Crossmatch, Group & Save, antenatal group & antibodies	For patients not known on patient records system, 2 separate blood samples are required
	Fluoride Oxalate	Glucose, lactate#, blood alcohol	# Contact lab before taking sample - samples must be received within 4 hours

## Venepuncture Sampling

There are many factors that contribute to accurate test results. The variables can be divided into three areas:

- During the preparation of the patient and equipment prior to venepuncture
- During the venepuncture procedure
- Handling and transportation of the sample

### Preparation

During the preparation of patient and the equipment prior to venepuncture:

- **Patient misidentification** - patients must be asked to verbally confirm their name, DOB and first line of their address and this must correlate with the blood request form
- **Incorrect form used/incorrect form for patient** - the Trust have a variety of request forms in use; haematology/immunology and chemical pathology requests, for microbiology, infection and HIV and for blood transfusion requests e.g. types of transfusion request and cross match. The correct type of request form must be used, be completed correctly and match the identification markers of the patient to ensure patient safety and correct treatment
- **Incorrect timing of the sample** - some analytes vary according to biological rhythms such as hormones (TSH, cortisol, testosterone), fasting samples (glucose and lipids) and cardiac enzymes (Trop T) Pathology must be informed if sample not taken at correct time
- **Incorrect selection of tubes required for a given test** - if the incorrect tube is used the patient will have to be re-bled causing discomfort to the patient and delays in treatment
- **Inadequate or prolonged fasting time since food was last consumed by the patient** - certain tests require the patient to have fasted before sampling. Inadequate fasting affects the reliability of the results e.g. glucose tolerance test and triglycerides. If a patient has not eaten for more than 14 hours a variation in the test results is also seen
- **Exercise** - blood should not be taken for at least an hour after vigorous exercise, due to marked changes in analytes. During exercise fluid volume shifts between the intravascular and interstitial compartments and volume is lost due to sweating and changes in hormone concentration
- **Incorrect posture** - during venepuncture- body posture influences blood constituents. The difference between the capillary pressure and colloidal osmotic pressure in plasma increases in the lower extremities when moving from a reclined to an upright position. Due to this water is moved from the intravascular compartment to the interstitium, reducing the plasma volume and thereby concentration of cells. Changes due to altered blood pressure also occur and result in the secretion of vasoactive compounds
- **Poor coordination of sampling with other treatments** - if there is inappropriate coordination between the collection times with the time of the medication dosage a patient may appear over or under medicated. This can lead to unnecessary changes in treatment. The blood should be taken for therapeutic drugs at the specified time

- **None or poor ANTT®** - the area to be accessed for venepuncture should be socially clean and vigorously cleaned for at least 30 seconds in an outward circular motion with a Chlorhexidine 2% and Alcohol 70% wipe to reduce the risk of bacterial contamination to the patient. The site must be allowed to dry completely before venepuncture to ensure the site is aseptic, to prevent stinging and the risk of the alcohol affecting the blood results adversely. All equipment must be sterile or clean and a non-touch technique employed throughout to avoid infection contamination.

## During the Venepuncture procedure

- **Selection of inappropriate gauge needle** - Only 19 to 23 gauge needles should be used for venepuncture. Lower gauge needles (24g, 25g etc.) should be avoided, as their use will result in haemolysis of the sample caused by forcing the blood through an extremely small opening under a great force. The red cell walls shear on the needle as they enter the tube. Too large a gauge needle must also be avoided as haemolysis may also be caused by allowing a large amount of blood to suddenly enter the tube with great force
- **Prolonged use of tourniquet** - if the tourniquet is left on for longer than a minute before accessing the vein, the results will be affected. The Clinical and Laboratory Standards Institute (CLSI) guidelines recommend that if a tourniquet is used for preliminary vein selection, it should be released and reapplied after two minutes. It should not be on the arm for longer than one-minute prior to accessing the vein and must be released on the first filling tube

This will cause elevated levels of:

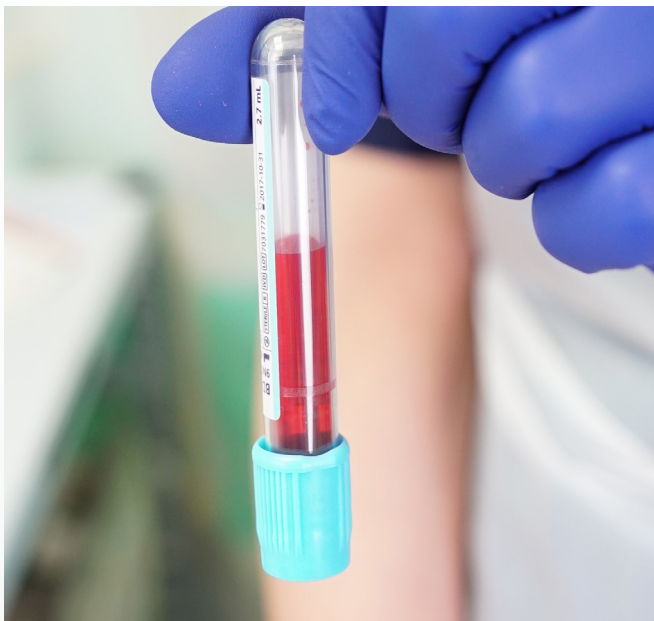
- Potassium
  - Total protein
  - Calcium
  - Bilirubin
  - ALT
  - AST
  - Cholesterol
  - Triglycerides
  - Albumin
  - Haemoglobin
- **Not allowing the antiseptic to dry** - the needle can transfer the antiseptic solution from the skin into the specimen causing haemolysis of the red cells. If the alcohol is not allowed to dry there will also be alteration of glucose, potassium, phosphorous and uric acid results. If iodine or povidone solutions are used and not allowed to dry, increases in; phosphorous, uric acid and potassium will occur. The alcohol will also cause pain and discomfort to the patient
  - **Selection of an inappropriate vein** - the use of small fragile veins can lead to haemolysis of the sample. An appropriately sized vein should be selected preferably one of the larger fuller veins in the antecubital area. Other acceptable sites include dorsal wrist and hand veins
  - **Taking blood from the site of a haematoma or intravenous therapy** - specimens collected from the site of a haematoma or intravenous therapy will cause erroneous results. The former will provide similar results to haemolysed samples and the latter will cause dilution of the sample and contamination from the contents of the drip

- **Incorrect order of draw in which the tubes are taken** - blood tubes contain additives in the form of liquid, gel or powder which maintain the blood sample in its optimum condition for accurate reliable blood results in the laboratory. Failure to follow the correct order of draw can result in falsely elevated blood results due to cross-contamination of additives;

potassium and sodium levels	spurious FBC results	contaminated blood cultures	erroneous coagulation results
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If blood tubes are under filled, do not attempt to add blood from other tubes for the reasons above and because of potential needle stick injury and infection contamination risk.

- **Incorrect ratio of anticoagulant to blood** - All tubes should be filled to full capacity to ensure the proper blood-to-additive ratio. Certain additives in high concentration can cause varying degrees of haemolysis e.g. sodium fluoride. In certain tubes like the coagulation and ESR tube the correct ratio of blood to anticoagulant is critical for the correct results. The EDTA tube is also affected if under filled.
- **Incorrect mixing of the sample** - blood tubes must be inverted not shaken when mixing for the correct number of times (see order of draw guidelines). Please allow the air bubble to travel from the top to the bottom of the tube and back again for 180 degrees to count as one inversion/mix



- Insufficient or delayed mixing in serum tubes may result in delayed clotting and incorrect results. In tubes with anticoagulant, inadequate mixing may result in platelet clumping, haemolysis, and clotting or incorrect results.

## Handling and transportation of the sample

As shown in the Trust Tube Guide and Pathology webpages, some blood samples require to be kept cool or warm, protected from light, taken at certain time lines or reach the laboratory within a maximum time span. For further information on blood tests that require special instructions, please access Pathology department Intranet site.

# Venepuncture Sampling - Standard ANTT Approach

## 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.

Peripheral venepuncture sampling is a clinically invasive procedure and must be performed using ANTT® principles [www.antt.org.uk](http://www.antt.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)

## Procedure Equipment

The Trust's blood collection equipment is provided by Becton Dickinson (BD) Company.

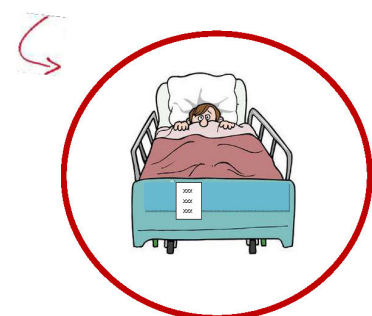
NB: Protect Key Parts and Key Sites throughout procedure.

- **First choice** - Vacutainer Holder (Single use) and Safety Eclipse needle sizes- 21g green or 22g black
- **Second choice** - Safety-Lok blood collection set ("butterfly") sizes- 21g green or 23g blue (for difficult venous access/safety reasons)
- Plastic procedure tray/sharps container
- Universal wipes to clean plastic tray
- Non sterile gloves (Nitrile) and disposable apron
- Correct blood tube bottle(s)
- Chlorhexidine 2% and alcohol 70% wipes
- Disposable tourniquet
- Sterile gauze and tape or plaster
- Separate rubbish bag if available/required
- Blood request forms
- Tube Order of Draw guidelines/other relevant documentation



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

## THE SAMPLE CIRCLE



**DO NOT LEAVE THE 'SAMPLE CIRCLE' WITH UNLABELLED SAMPLES!**

Doing so puts your patients at serious risk of wrong treatment

- All samples **MUST** be labelled at the patient's side (from the ID band for inpatients)
- Unlabelled samples **MUST** not leave the circle
- Unlabelled samples outside the circle **MUST** be disposed of
- Only the person who took the sample is permitted to write on the tube label

Modified from the original poster by Jay Murphy, TP, Northampton General Hospital, 2013  
Blood Transfusion Dept GHNHSFT 3 February 2014.

## The Procedure

Venepuncture must be an uninterrupted procedure to avoid errors (potentially fatal), with patient misidentification and wrong blood in tubes (WBIT).

1. Wash hands using 6 stage Ayliffe Procedure
2. Ask patient to confirm identification and verbally gain informed consent
3. Ensure that any conditions required prior to the test have been met e.g. fasting
4. Position arm e.g. on pillow and use methods to raise the vein e.g. tourniquet if required



5. Assess/identify for suitable veins and check if needle phobic – may need to lay down
6. Complete vessel health preservation (VHP) assessment
7. Equipment Prep zone: Wash hands and clean plastic tray and allow to air dry
8. Gather all appropriate venepuncture equipment, checking for expiry dates and integrity and place in tray
9. Patient zone: Clean hands with sanitising gel/foam and put on apron and gloves. Apply disposable tourniquet 8-10cms above the intended puncture site and re-identify vein
10. The tourniquet should only be applied for a maximum of one minute. If tourniquet not applied at this point, ensure it is applied before needle insertion (no.14)
11. Clean the skin over the selected vein using a 2% chlorhexidine and alcohol 70% wipe for 30 seconds using a circular motion moving outwards up to a 10 cms area. Allow to air dry (about 30 seconds). If the site is re-palpated, re-clean it using another wipe and allow to air dry
12. Connect the holder to the needle or “butterfly” as chosen and once assembled, remove the needle cover



13. Stabilise the vein by applying manual traction on the skin below or beside the intended puncture site with the least dominant hand

14. With the dominant hand insert the needle bevel uppermost, directly over the vein at an angle of approximately 15-20 degrees

15. Using the Safety Eclipse holder and needle or Safety Lok "butterfly", draw off the required specimen(s) using the correct bottles in the correct order of draw. (Note: butterfly system – need x2 bottles of first in order of draw [blue] as first one won't fill due to air in the butterfly line. The first bottle must be discarded)



16. Release the disposable tourniquet once blood enters the first blood sample bottle

17. Invert the tubes according to the order of draw specific mix instructions. Do not shake the tubes. TIP - mix each blood tube sample 1-2 times after sampling and complete total mix at end of procedure

18. Place the sterile gauze over the needle and remove the needle. Immediately activate the needle safety guard using a one handed technique and dispose of whole unit immediately into a sharps container



19. Apply pressure to the venepuncture site with sterile gauze. When the bleeding has stopped, apply new sterile gauze and tape or a plaster. This can be removed after twenty minutes or so. Ask patient to inform staff if any complications e.g. further bleeding

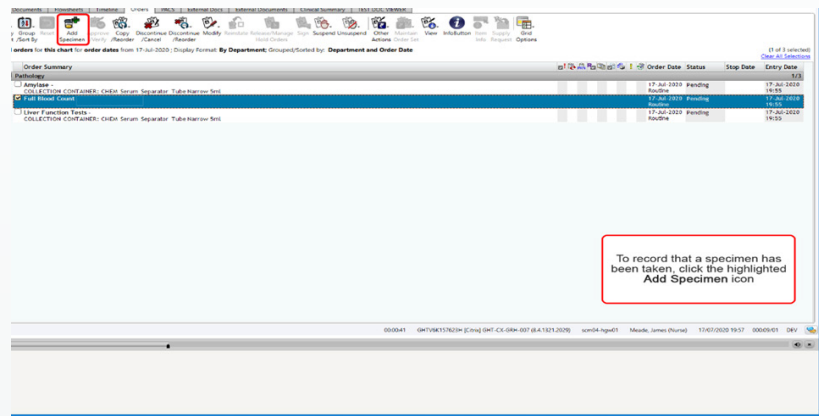


20. Label the bottles according to the pathology guidelines and insert into blood request form/ packet. Check form against patient and complete date, time and signature on the blood form
21. Decontamination zone: Dispose of waste as per Infection Control guidelines/waste stream
22. Remove PPE and sanitise hands
23. Clean the plastic tray and allow to air dry
24. Ensure safe/timely transportation of blood tubes to the laboratory
25. Document blood sample (s) taken and verbal informed consent given in appropriate Trust approved documentation
26. Follow up results if able to or report blood sample (s) taken to nursing or medical staff to follow up results/review treatment

**In the event of a splash or sharps injury actions must be taken in accordance with policy.**

## Completing the Blood Sample

The sample tube must be labelled immediately at the patient's side after the blood sample has been taken - there must be no pre-labelling. Only the person taking the blood is permitted to fill in the details on the tube label. Information must be hand-written using a ball point pen so the ink does not smudge. Specimens where the label has had patient data crossed out or altered will not be accepted. For sampling via EPR system, confirm blood collection and attach printed labels to the blood samples.



## Summary

This pre-course material should prepare you for your training session and is a useful resource for future reference. If you have any queries concerning this skill after the attendance at the training session, please do not hesitate to contact us. If you have any queries, please contact the Clinical Skills Department on:



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