

Cross Site Vascular Access and IV Therapy Clinical Guidelines

Part 9: Arterial catheter placement and arterial blood sample collection

Key Points

- Arterial Blood collection using a needle and syringe and arterial cannula placement, care and maintenance is undertaken to monitor blood gasses and for invasive blood pressure monitoring.
- The practice of arterial puncture is only to be undertaken by competence.

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Abbreviations

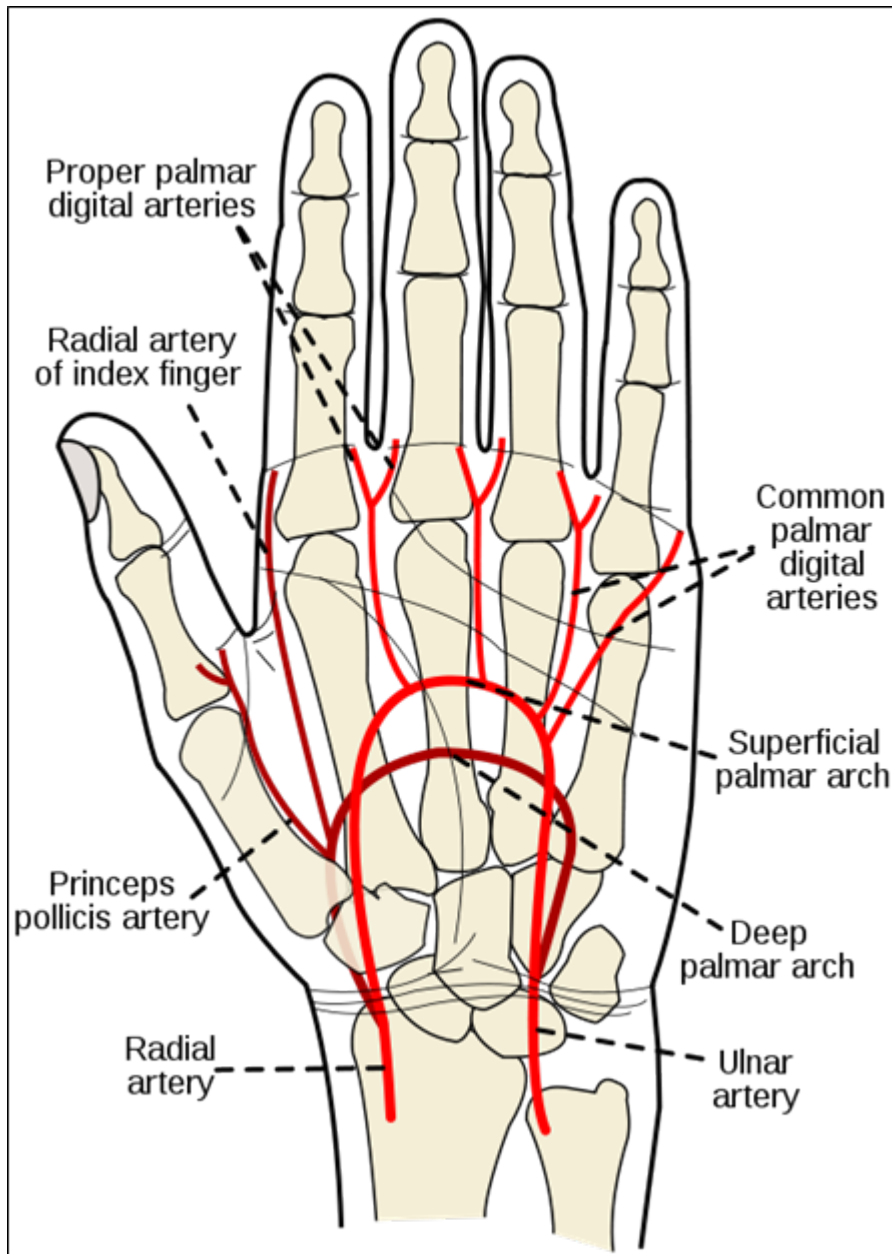
ACF	Antecubital Fossa
ANTT	Aseptic Non-Touch Technique
COPD	Chronic Obstructive Pulmonary Disease
CRBSI	Catheter Related Blood Stream Infection
CVC	Central Venous Catheter
ECG	Electrocardiogram
GI	Gastrointestinal
IV	Intravenous
IVAS	Intravenous and Vascular Access Services
LocSSIP	Local Safety Standards
MC&S	Microscopic Culture and Sensitivity
NICE	National Institute for Health and Care Excellence
NIVAS	National Infusion and Vascular Access Society
NST	Nutritional Support Team
OPAT	Outpatient Parenteral Antibiotic Therapy
PICC	Peripherally Inserted Central Catheter
PN	Parenteral Nutrition
PSA	Procedural Sedation and Analgesia
PVC	Peripheral Venous Catheter
RIVC	Renal IV Catheter
SPN	Supplemental Nutrition
STA-CVC	Short Term Acute Central Venous Catheter
TCCVC	Tunnelled Cuffed Central Venous Catheter
TIIP	Totally implanted Intravenous Port
TPN	Total Parenteral Nutrition
VA	Vascular Access
VAD	Vascular Access Device
VasCath	Vascular Catheter

1. ARTERIAL CATHETERS AND BLOOD GAS COLLECTION

Arterial catheter placement is undertaken in order to monitor Intra-arterial blood pressure measurements. This is more accurate than measurement of BP by non-invasive means, especially in the critically ill. Intra-arterial BP management permits the rapid recognition of BP changes, which is vital for patients on continuous infusions of vasoactive drugs. Blood samples can also be obtained for an arterial catheter.

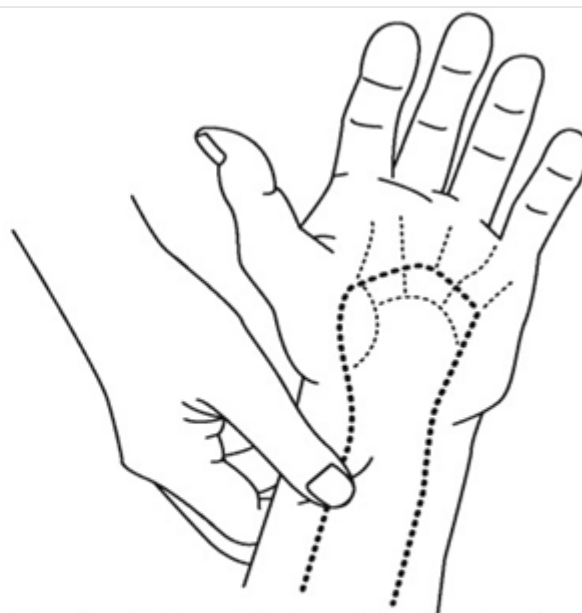
Arterial Blood collection to test blood gases is undertaken using the same principles; however, a needle and syringe is used to cannulate the artery and removed after the blood sample has been obtained.

- Arterial cannulation also allows repeated arterial blood gas samples to be drawn without injury to the patient.
- Arterial Cannulation is a competency-based procedure.
- The Vascular Access LocSSIP must be followed (Part 2 of these guidelines).
- Insertion of arterial catheters is undertaken in the radial artery by an experienced and competent practitioner.
- Nurses undertaking this practice must be competency assessed.
- The brachial artery can be used if the radial arteries are not available.
- Insertion should be undertaken using a sterile technique.
- Ultrasound insertion should be considered if available.
- An arterial/Acute CVC care bundle should be commenced.
- A single film dressing and adhesive fixation device should be used to secure the catheter.
- Before the insertion of an arterial catheter an Allen test should be undertaken to assess the arterial blood flow through the hand.





Thumbs occlude radial and ulnar arteries.
Pallor is produced by clenched fist.



Thumb occludes radial artery while ulnar artery is released and patent. Unclenched hand returns to baseline colour because of ulnar artery and connecting arches.



2. ARTERIAL BLOOD COLLECTION USING NEEDLE AND SYRINGE

- Approach the patient, introduce yourself and ask the patient to state their full name.
- Place the patient on their back, lying flat. Ask the nurse for assistance if the patient's position needs to be altered to make them more comfortable. If the patient is clenching their fist, holding their breath or crying, this can change breathing and thus alter the test result.
- Locate the radial artery by performing an Allen test for collateral circulation. If the initial test fails to locate the radial artery, repeat the test on the other hand. Once a site is identified, note anatomic landmarks to be able to find the site again. If it will be necessary to palpate the site again, put on sterile gloves.
- Perform hand hygiene, clear off a bedside work area and prepare supplies. Put on an impervious gown or apron, and face protection, if exposure to blood is anticipated.

- Disinfect the sampling site on the patient with 70% alcohol and allow it to dry.
- If the needle and syringe are not pre-assembled, assemble the needle and heparinized syringe and pull the syringe plunger to the required fill level recommended by the local laboratory.
- Holding the syringe and needle like a dart, use the index finger to locate the pulse again, inform the patient that the skin is about to be pierced then insert the needle at a 45-degree angle, approximately 1 cm distal to (i.e., away from) the index finger, to avoid contaminating the area where the needle enters the skin.
- Advance the needle into the radial artery until a blood flashback appears, then allow the syringe to fill to the appropriate level. **DO NOT** pull back the syringe plunger.
- Withdraw the needle and syringe; place a clean, dry piece of gauze or cotton wool over the site and have the patient or an assistant apply firm pressure for sufficient time to stop the bleeding. Check whether bleeding has stopped after 2–3 minutes. Five minutes or more may be needed for patients who have high blood pressure or a bleeding disorder or are taking anticoagulants.
- Activate the mechanisms of a safety needle to cover the needle before placing it in the ice cup. In the absence of a safety-engineered device, use a one-hand scoop technique to recap the needle after removal.
- Expel air bubbles, cap the syringe and roll the specimen between the hands to gently mix it. Cap the syringe to prevent contact between the arterial blood sample and the air, and to prevent leaking during transport to the laboratory.
- Label the sample syringe.
- Dispose appropriately of all used material and personal protective equipment.
- Remove gloves and wash hands thoroughly with soap and water, then dry using single-use towels; alternatively, use alcohol rub solution.
- Check the patient site for bleeding (if necessary, apply additional pressure) and thank the patient.
- Label all samples accurately and record in the computer and pathology register
- Transport the sample immediately to the laboratory, following laboratory handling procedures.

3. BLOOD SAMPLING FROM AN ARTERIAL CATHETER

- Maintain a sterile ANTT, clean the arterial catheter needle free PORT with a clinell wipe and allow to dry, placing the cleaned port on top of a sterile drape.
- Attach a syringe to the needle free port.
- Withdraw 2mls of blood using the opening mechanism of the device or transducer set.
- Apply the ABG syringe to the needle free port and obtain the blood sample.
- Flush the arterial catheter with 10mls normal saline or via the transducer set until the lumen is free of blood.
- Label the syringe and test immediately.

4. SAMPLING ERROR

Inappropriate collection and handling of arterial blood specimens can produce incorrect results. Reasons for an inaccurate blood result include

- Presence of air in the sample.
- Collection of venous rather than arterial blood.
- An improper quantity of heparin in the syringe, or improper mixing after blood is drawn.
- A delay in specimen transportation.

5. COMPLICATIONS RELATED TO ARTERIAL BLOOD COLLECTION

There are several potential complications related to arterial blood sampling. The points below list some of the complications related to the procedure, and how they can be prevented.

- Arterio-spasm or involuntary contraction of the artery may be prevented simply by helping the patient relax; this can be achieved, for example, by explaining the procedure and positioning the person comfortably.
- Haematoma or excessive bleeding can be prevented by inserting the needle without puncturing the far side of the vessel and by applying pressure immediately after blood is drawn. Due to the higher-pressure present in arteries, pressure should be applied for a longer time than when sampling from a vein, and should be supervised more closely, to check for cessation of bleeding.
- Nerve damage can be prevented by choosing an appropriate sampling site and avoiding redirection of the needle.

- Fainting or a vasovagal response can be prevented by ensuring that the patient is supine (lying down on their back) with feet elevated before beginning the blood draw. Patients requiring arterial blood sampling are usually inpatients or in the emergency ward, so will generally already be lying in a hospital bed. Children may feel a loss of control and fight more if placed in a supine position; in such cases, it may be preferable to have the child sitting on the parent's lap, so that the parent can gently restrain the child.
- Other problems can include a drop in blood pressure, complaints of feeling faint, sweating or pallor that may precede a loss of consciousness.

6. CARE AND MAINTENANCE OF ARTERIAL CATHETER AND MONITORING SET

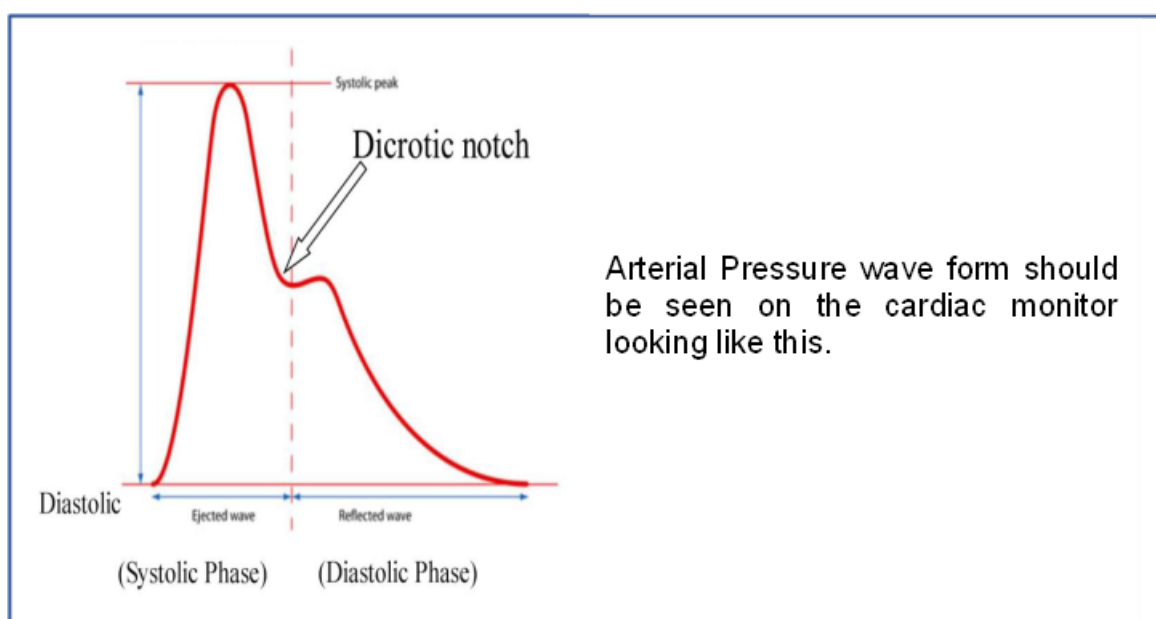
- The procedure of insertion is performed under strict aseptic technique.
- The care and maintenance of the arterial cannula is the same for a venous peripheral cannula.
- The indwell time should not exceed more than 10 days.
- A visual inspection for signs of phlebitis or other complications should be undertaken every 6 hours in line with the peripheral venous cannulation guideline and documented on the care bundle.

For Arterial pressure monitoring equipment:

- Pressure bag needs to be inflated to 300mmHg which infuses 3-5ml/hr.
- Flush bags of 0.9% sodium chloride are changed every 24 hrs.
- Fast flush solutions after opening the system for blood sampling and/or zeroing to eliminate air bubbles and clear the line of residual blood. Air bubbles may lead to wrong pressure reading.
- Ensure the line and blood sampling port is free of blood at all times and closed to air with an arterial line cup.
- For radial and brachial arterial lines, keep the arm in extended position for accuracy and patency of the line.
- Keep the arterial site clearly visible at all times, e.g., on top of sheets. Use a clear type dressing over the arterial line exit site for clear view of the site at all times and to prevent unnoticed adverse events such as haemorrhage or disconnection and signs of infection.
- Position the transducer so that it is level with the heart or phlebo-static axis (4th intercostal space mid axillary line).

- Secure arterial line appropriately as per guidelines/ recommendations.
- Set appropriate scale and alarm parameters every shift and as appropriate.
- Set appropriate arterial blood pressure label on the patient monitor.
- Alarms to remain on at all times, with appropriately set limits.
- Check for signs of infection (redness, swelling, pain and discharge) and document on your shift. Inform Medical Officer if applicable.
- Arterial line must be labelled.
- Only dedicated arterial bungs or arterial cannula caps are to be used after replacing the cap that comes in the arterial or transducer set.
- Re-zero the transducer once per shift or as required, such as after disconnection from the monitor and/or transducer cable, after re dressing the arterial site, after accessing the arterial line for blood sample, after troubleshooting the line, etc.
- Ensure that there is a non-invasive blood pressure cuff and module in the bed area available if necessary.
- When measuring non-invasive blood pressure (NIBP) use alternate arm to invasive arterial cannulation.

Do not inject any medication or other substances via the arterial line.
The only purpose of an arterial line is for close blood pressure monitoring and blood sampling.



7. CARE BUNDLE FOR ARTERIAL CATHETERS

Avatar

Arterial Line Right Radial

Assessment

Time taken: 24/3/2025 10:29 Responsible: Realize Create Note Macro Manager

Orientation: Right Location: Radial

Reason for Line Necessity

VIP Score

VIP Assessment

Line Status

Art Line Waveform

Art Line Interventions

Concerns with colour/movement/sensation

Transducer changed

Length of time the transducer has been in (hrs)

NaCl 0.9% fluid for transducer completed

Dressing Status

ANTT followed?

Create Note

Accept Cancel

Recent Assessments

Assessments

No assessment to display.

Full version control record

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This guideline is for use in Frimley Health NHS Foundation Trust hospitals only. Any use outside this location will not be supported by the Trust and will be at the risk of the individual using it.

Version Control Sheet

Version	Date	Guideline Lead(s)	Status	Comment
1	03/04/17	Advanced Nurse Practitioner Vascular Access	Final	
2	05.11.2019	Advanced Nurse Practitioner Vascular Access	Final	Ratified at NMB
2.1	Jan 2023	Advanced Nurse Practitioner Vascular Access	Draft	Scheduled review
V3	May 2025	IVAS Nurse Consultant	Final	Scheduled review

Related Documents

Document Type	Document Name
Guideline	Part 1 Vascular Access Policy
Guideline	Part 2 Vascular Access LocSSIP
Guideline	Part 3 Peripheral Cannulation Guidelines
Guideline	Part 4 Venepuncture Guidelines
Guideline	Part 5 Midline Guidelines
Guideline	Part 6 PICC Guidelines
Guideline	Part 7 Short Term Acute CVC Guidelines
Guideline	Part 8 Implanted PORTS and Tunnelled Cuffed CVCs
Guideline	Part 10 Injectable Medicines Policy
Guideline	Part 11 Extravasation Guidelines
Guideline	Part 12 Long-term CVC Complication Guidelines
Guideline	Procedural Sedation and Analgesia guideline
Guideline	FHFT IPC Manual https://guidelines.fhft.nhs.uk/
Guideline	RCN Infusion Standards
Guideline	INS Infusion Standards
Guidance	EPIC