1. INTRODUCTION

The clinical significance of an arterial puncture, its rapid analysis make it an important tool used by physicians to assess and re-assess the treatment of their patients, especially in patients who are critically ill, to determine gas exchange levels in the blood related to respiratory, metabolic, and renal function.

2. PURPOSE

2.1 To provide safe and consistent guidelines for arterial puncture procedure.

3. POLICY

3.1 The trained Respiratory Therapist will do arterial puncture: Senior Respiratory Care Practitioners (SRCPs), Respiratory Care Practitioners (RCPs) and Respiratory Therapy Technicians (RTTs), after the written order of ICS physician.

3.2 Avoid using radial artery with negative modified Allen's test, as this denotes insufficient collateral circulation.

3.3 Ideally, pre-heparinized ABG syringe should be used.

3.4 In event of running out of pre-heparinized syringes, non-heparinized syringes should be flushed with 0.05ml of 1:1000 Heparin solution and emptied **(DO NOT LEAVE EXCESSIVE HEPARIN IN THE SYRINGE).**

3.4.1 Heparin is used to coat the inside surface of the syringe and the barrel of the needle to prevent the blood from clotting.

3.4.2 Excessive amounts of heparin will affect pH and PCO_2 (more heparin it will increases dilution effect, decreased the HCO3and decreases PCO_2).

3.4.3 Approx. 0.05 ml of heparin will anti-coagulate 1 ml of blood.

3.4.3.1 Amount 0.1 ml of heparin does not appear to alter pH, PCO_2, or PO_2.

3.4.3.2 When non-heparinized syringes (preferred 3/5 ml syringe) is flushed with heparin and then emptied.

4. RESPONSIBILITY

All Respiratory Care Practitioners (RCP) staff under RCD.

5. APPLICABILITY

This policy applies to all Intensive Care Services ICS staff.

6. PROCEDURES

6.1. Verify Physician's order.

6.2. Correctly identify patient as per the hospital approved identification guidelines.

6.3. Check patient's record for precautions to be taken i.e. (Arteriovenous Fistula, and coagulation profile should be checked and if there is any abnormality should be addressed to the doctor.

Lab Values: Acceptable range as per the Lab of PSMMC

No.	Laboratory item	Abbreviation	Normal range	Units
1	Platelet Count	Plt	150,000 to 400,000	10 ^9/L
2	International Normalized Ratio	INR	0.9 to 1.3	

6.4. Introduce yourself to the patient and explain what you are about to do whenever possible.

6.5. Palpate right and left radial pulses. Select the artery with the most prominent pulse for puncture, but always check the non -dominant arm first, and if possible use radial artery in that wrist.

6.6. Perform the modified Allen's test on hand with best radial pulse, to ensure adequate collateral circulation.

6.6.1. **MODIFIED ALLEN'S TEST:**

6.6.1.1. **In the conscious, cooperative patient:**

6.6.1.1.1. Compress both radial and ulnar arteries at the wrist to obliterate pulse.

6.6.1.1.2. Have patient clench and release a fist until blanching of the hand occurs.

6.6.1.1.3. With radial artery still compressed, release pressure on ulnar artery.

6.6.1.1.4. Watch the return of pinkness to the hand within 3 to 6 seconds.

6.6.1.2 In the Unconscious, Uncooperative Patient:

6.6.1.2.1 Compress both radial and ulnar arteries at the wrist to obliterate pulses.

6.6.1.2.2 Elevate patient's hand above level of his/her heart.

6.6.1.2.3 Lower patients hand below level of his/her heart.

6.6.1.2.4 With radial artery still compressed, release pressure on ulnar artery.

6.6.1.2.5 If pink color fails to appear, collateral circulation may be assumed inadequate.

6.6.1.2.6 A positive modified Allen's test denotes the presence ulnar collateral flow.

6.7 Open an ABG collection set, pre heparinized ABG syringe with gauge 23 needle, cap and/or cork.

6.8 Assemble the syringe, keeping the chamber and tip sterile.

6.9 Attach needle to the syringe, keeping the needle in sterile protective cap.

6.10 Palpate the chosen radial artery as before, noting the point of maximal pulse. This will be the puncture site.

6.11 Stabilize the wrist in the position that presents the maximal pulse.

6.11.1 For radial puncture, the arm is abducted with the palm facing up and the wrist extended about 30 degrees to stretch and fix the soft tissues over the bone.

6.11.2 For dorsalis Pedis, slightly shallower angle, avoid over-distension of the foot.

6.12 Rub/ swab in circular motion from inward to outward with alcohol swab.

6.13 Remove the needle cap. And at 45 degree angle, needle bevel up pierce the skin at the puncture site, and slowly advance the needle in one plane, when the artery is punctured, blood will enter the syringe, if the needle goes through the artery, slowly withdraw the needle until blood again appears in the syringe **(1.5- 2ml)**. Refer to the **POCT GEM Premier 4000 Blood Gas Analyzer Policy No: 1-1-8062-07-033 and POCT GEM Premier 5000 Blood Gas Analyzer Policy No: 1-1-8062-07-034.**

6.14 After blood has filled the syringe **(not less than 0.2ml)**, withdraw the needle and immediately apply pressure directly on the puncture site with sterile gauze and/or cotton balls.

6.14.1 If there is no backflow:

6.14.1.1 Re-assess pulse location.
6.14.1.2 Withdraw needle to just below the skin.
6.14.1.3 Adjust needle angle, as necessary.
6.14.1.4 Advance the needle into the artery.
6.14.1.5 Limit the number of attempts to 3 at any one site.
6.14.1.6 Limit punctures to 2 attempts per RCP.

6.15 After applying pressure at the puncture site for a sufficient period, cover site with gauze and/or cotton balls and cover with medical adhesive dressing tape/ medical tape.

6.16 Hold syringe vertically, gently tap the barrel and advance the plunger until it forces air bubbles out of the syringe.

6.17 Remove needle and cap syringe. Gently roll the syringe between the palms of your hands to mix heparin not to the heat point.

6.18 Enter patient's medical record no., full name and FiO_2.

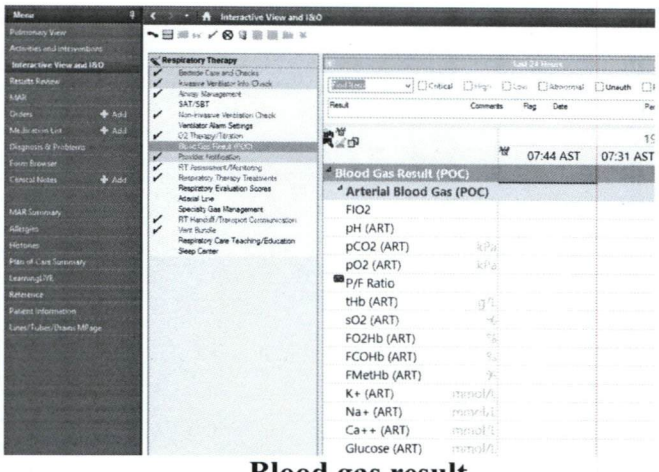
6.19 If analysis will be within 30 minutes, should be kept at room temperature.

6.20 If analysis will delayed more than 30 minutes, storage in ice water should be considered.

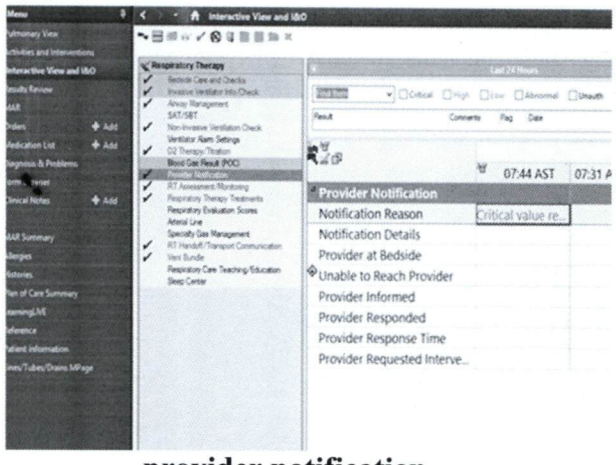
6.21 Analyze the arterial blood and inform result to the Physician.

6.22 Document in Cerner, Blood Gas Result (POC), date and time of results.

6.23 If blood gas result critical, inform the doctor and document it in Cerner, provider Notification.



Blood gas result



provider notification

IMPORTANT POINTS

6.23.1 Throw all sharps such as needles in sharp box and syringe in appropriate bin.

6.23.2 Never recap needle.

6.23.3 Any needle stick must be reported as per PSMMC Policy.

6.24 INDICATIONS:

6.24.1 Identification of respiratory, metabolic, and mixed acid-base disorders.

6.24.2 Measurement of the partial pressures of respiratory gases involved in oxygenation and ventilation.

6.24.3 Monitoring of acid-base status, as in-patient with diabetic ketoacidosis (DKA) on insulin infusion.

6.24.4 Assessment of the response to therapeutic interventions such as mechanical ventilation in a patient with respiratory failure.

6.24.5 Determination of arterial respiratory gases during diagnostic evaluations.

6.24.6 Quantification of oxyhemoglobin, which, combined with measurement of arterial oxygen tension (PaO_2), provides useful information about the oxygen-carrying capacity of the patient.

6.24.7 Quantification of the levels of abnormal hemoglobins (eg, carboxyhemoglobin and methemoglobin).

6.24.8 Procurement of a blood sample in an acute emergency setting when venous sampling is not feasible (many blood chemistry tests could be performed from an arterial sample)

Note: VBG sampling may be an acceptable alternative to ABG sampling in critically ill patients who are hemodynamically stable and do not have severe acid-base disturbances.

6.25 CONTRAINDICATIONS

6.25.1 Negative results of modified Allen's test.

6.25.2 Arterial puncture should not be performed through a lesion or through a distal surgical shunt (ex. Dialysis patient).

6.25.3 If there is evidence of infection or peripheral vascular disease involving selected limb. Choose alternate site.

6.25.4 A coagulopathy or medium- to high- dose anticoagulation therapy, (eg. Heparin or warfarin, streptokinase, and tissue plasminogen activator.

6.26 COMPLICATIONS

6.26.1 Bleeding
6.26.2 Arteriospasm
6.26.3 Infection
6.26.4 Hematoma
6.26.5 Thrombus
6.26.6 Pain
6.26.7 Hemorrhage

6.26.8 Air or clotted blood emboli
6.26.9 Trauma to the vessel
6.26.10 Arterial occlusion

6.27 Pitfalls:

6.27.1 Venous puncture instead of arterial puncture
6.27.2 Air bubbles left in syringe.
6.27.3 Heparin left in syringe.
6.27.4 Specimen not placed on ice if analysis not done within 15 minutes.
6.27.5 Clotted specimens.
6.27.6 If samples are on ice, analysis exceeding 2 hours.
6.27.7 Blood sample hemolyzed or not mix well

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