

University of Texas Medical Branch	Effective Date:	Nov 90
Pulmonary Function Clinic	Revised Date:	Aug 23
Policy 04-02 ABG Sampling	Review Date:	Aug 23

Arterial Blood Gas Sampling

Audience All Respiratory Therapists in the Pulmonary Function Clinics.

Purpose Obtaining a blood sample by arterial puncture, using aseptic technique, for analysis of PaO₂, PCO₂, pH, and oximetry measurements.

Preparation Upon completing documented instruction, and supervised punctures, all Respiratory Therapists may perform arterial punctures in the Pulmonary Function Clinic under the order of a physician.

Therapist will review patient orders before procedure begins and may confirm patient name and date of birth as a second verification from the initial introduction. See policy 03-02 Patient flow through Pulmonary Clinic.

The following is the correct way to obtain an arterial blood gas:

- The specimen will be obtained from the radial artery only, using a pre-packaged 3 cc syringe with 100 units of lyophilized lithium heparin. The brachial artery shall not be used for arterial puncture unless requested by the Director, Supervisor or Medical Director.
- After the radial artery site is chosen, a modified Allen's test will be used to determine if collateral circulation by the ulnar artery is adequate.
- The Therapist that performs the arterial puncture should analyze the sample, input the patient information into the ABG analyzer, and generate the report for the Medical Record. Simply put, the Therapist that draws the blood sample will personally follow through to the completion of the analysis and reporting of the results of that sample. This is to prevent any possible mixing of patients and subsequently the test results. **Additionally, the therapist will affix a patient label to the arterial blood gas syringe before placing in waste disposal in such a way to avoid display of patient information.**
- Staff are expected to use **Personal Protective Equipment (PPE)** while performing this procedure. (This includes gloves, gowns and protective eyewear).
- Before performing an arterial puncture for blood gas analysis, the patient should be interviewed for contraindications relating to blood draw. Therapist may ask relative questions relating to anti-coagulant therapy, history of allergies specifically for Lidocaine and Iodine, and if patient has history of fainting during previous blood draws. Gathering of all pertinent information should ensure patient and therapist safety during this procedure.
- This interview will include history and status of any infectious disease processes and the therapist will follow institutional policies for handling high-risk samples. Refer to HCE policies.
- Under routine conditions, blood gas sampling will be done with the patient breathing room air unless specified by the requesting physician. In these cases, the conditions under which the blood gas sample was drawn will be documented on the blood gas/pulmonary function report. If the patient arrives in the Pulmonary Function Laboratory using supplemental oxygen, and

University of Texas Medical Branch	Effective Date:	Nov 90
Pulmonary Function Clinic	Revised Date:	Aug 23
Policy 04-02 ABG Sampling	Review Date:	Aug 23

a blood gas with the patient breathing room air is needed, the patient will be taken off the oxygen for no less than 10 minutes before the blood gas sample is drawn.

Indications The primary indication for arterial blood gas analysis is for the need to assess the patient's respiratory or metabolic status.

In the Pulmonary Function Clinic, the primary indication for arterial blood gas analysis is to provide for a complete pulmonary function study.

Contraindications

Contraindications can include the following:

- Negative modified Allen's test, which indicates the absence of ulnar collateral circulation.
- Any inflammation, infection, or poor integrity of the selected puncture site such as lesion or distal to surgical shunt (dialysis patient).
- Relative contraindication for arterial puncture in a patient with diagnosed Raynaud's Syndrome or other connective tissue disease.
- Medium-to high dose anticoagulation therapy.

If any of the above contraindications are noted, therapist may seek guidance from Manager, Supervisor or Medical Director for further direction.

Procedure The following is the correct procedure- for obtaining specimens:

- Palpate right and left radial pulses. Select vessel with the most prominent pulse for puncture. If pulse is not palpable, see Supervisor or Director for further direction.
- Perform modified Allen's test on the hand with the most prominent radial pulse to insure adequate collateral circulation.

Modified Allen's Test:

1. Compress both radial and ulnar arteries at the wrist to obliterate pulses.
 2. Have patient clench and release a fist until blanching of the hand occurs (about three times).
 3. With radial artery still compressed, release pressure on ulnar artery.
 4. Watch for reperfusion or return of color to hand. Should occur within 10 to 15 seconds.
 5. If reperfusion of the hand does not occur, collateral circulation may be inadequate. Arterial puncture may not be performed. Therapist may seek guidance for further direction, if necessary.
- Before drawing prep and opening ABG kit, therapist will verify items are within expiration date.

University of Texas Medical Branch	Effective Date:	Nov 90
Pulmonary Function Clinic	Revised Date:	Aug 23
Policy 04-02 ABG Sampling	Review Date:	Aug 23

- Using aseptic technique, draw-up 0.25 cc of 2% Lidocaine solution with a tuberculin syringe. This will be used for local anesthesia of the puncture site.
- With fully gloved hands, palpate the radial pulse and prep area with an alcohol swab. Removing any part of glove for palpation is not acceptable.
- Inject the 2% Lidocaine solution along side of the puncture site using intradermal technique (i.e., 10-degree angle, bevel up, injecting solution to make a wheal above the puncture site).
- Clean puncture site with an iodine swab, let dry, and wipe in one pass with alcohol swab.
- Using a pre-heparinized syringe with attached needle, re-palpate artery above wheal and penetrate skin with the bevel of the needle up and at a 45-degree angle.
- Penetrate the artery and obtain 1-3 ccs of blood.
- Withdrawal needle and immediately apply pressure to the puncture site using gauze sponge.
- Using the one-handed technique, carefully utilize the safety device and evacuate any air from the blood sample to avoid ambient air contamination.
- If unsuccessful at obtaining the sample for any reason, the Therapist may make one more attempt for a total of two attempts at obtaining an arterial blood sample. If the Therapist is unsuccessful with the second attempt, the Therapist will not make another attempt unless physician orders require to obtain ABG. Therapist may defer the sampling to another Therapist or Director and/ or Supervisor of the lab for assistance.
- If unable to obtain an arterial blood sample, obtain patient's SpO2 by using the Pulse Oximeter and note the result on the Pulmonary Function Report.
- Maintain pressure on the puncture site for a minimum of 5 minutes.
- Assure bleeding has stopped.
- Analyze blood in the current PFT lab analyzer.
- Carefully discard the syringe and needle into a puncture-resistant leakproof (sharps) container. Discard gauze, alcohol, and iodine swabs into a waste container.
- A blood gas sample will be run within 30 minutes of obtaining the sample per institutional policy. Therapist will carefully observe for any ambient air "air bubbles" and expel from the sample immediately. Sample will be mixed well before attempting analysis. Blood samples that are beginning to or have already coagulated are unacceptable for analysis.
- If patient's PaO2 is < 60 torr, contact the ordering physician before proceeding with the pulmonary function studies. See policy 04-07 Test Data: notification of physician for critical level results.
- If patient's PaO2 is < 65 torr, obtain SpO2 using the Pulse Oximeter and note results on Pulmonary Function Test.

University of Texas Medical Branch	Effective Date:	Nov 90
Pulmonary Function Clinic	Revised Date:	Aug 23
Policy 04-02 ABG Sampling	Review Date:	Aug 23

Undesirable Side Effects / Adverse Reactions

Precautions: Those patients receiving anticoagulant therapy must be observed closely. No substances in normal blood will interfere with pH and PCO₂ measurements. Blood from patients anaesthetized with nitrous oxide or halothane may give unreliable PO₂ values due to the influence of these anesthetic gases on the PO₂ electrode. Patients who have received lipid therapy will have an abnormally high blood lipid content, which causes some interference in pH measurements. Samples from such patients should be labeled so that these contaminants can be considered in the interpretation on the results.

The following are considered to be undesirable side effects:

Infection: Sterile technique must be used so that no pathogens will be passed directly into the patient's blood stream.

Hematoma: Bleeding from the artery into the surrounding tissue can occur if insufficient time or pressure is not applied to the puncture site. Patients on anti-coagulant therapy (i.e., aspirin, coumadin, heparin) will be especially susceptible to the complication.

Patients who are no longer receiving anti-coagulation dosages of the following drugs will still be susceptible to this complication for the listed length of time:

- Aspirin – 8 days
- Heparin – 4 hours
- Coumadin – 2-5 days

Thrombus: When an artery is punctured there is always a danger of a thrombus forming and blocking the arterial blood flow. For this reason, it is necessary to check for collateral circulation (modified Allen's test) before the puncture and check for a pulse distal to the puncture site following the procedure.

Peripheral Nerve Damage: The radial and brachial nerves run adjacent to the artery and passing a needle through them can do permanent damage.

Pain: Since arteries have their own nerve supply and major nerves pass close to them, this procedure can be very painful. It is always necessary to prepare the patient for this possibility to avoid unnecessary movement.

Fainting or Seizure: Fainting during or after blood drawing can trigger a reflex of the involuntary nervous system (vasovagal reaction) that slows the heart and dilates the blood vessels in the legs and causes one to feel nausea, sweating, or weakness. The patient will normally regain consciousness by just sitting or lying down. Staff will recline blood drawing chair (if possible) or prop feet up (if possible), monitor vitals every 3-5 minutes until patient is stable and is no longer feeling lightheaded, dizzy or nauseous. Administer oxygen via nasal cannula at 2

University of Texas Medical Branch	Effective Date:	Nov 90
Pulmonary Function Clinic	Revised Date:	Aug 23
Policy 04-02 ABG Sampling	Review Date:	Aug 23

lpm, if SpO2 is low. Patient will remain in PFT Lab until vital signs return to normal. If patient recovers with no other adverse effects, therapist will document event. Notify ordering physician or PFT fellow, if necessary. If patient agrees, testing may resume.

Recognition of Adverse Event

Therapist are trained in performing ABG punctures and maintain annual and continuous training. Reference policy 2-2.

Method of Evaluating the Effectiveness of Procedure

This procedure shall be deemed effective if the procedure is performed with minimal pain to the patient and without permanent damage and the results of analysis are interpreted by qualified medical personnel and appropriate adjustments in the patient's care are made as needed.

Specimen Audit

Each quarter, one therapist will be observed for specimen collection and handling and noted on the ABG Audit Log. The audit will be collected and presented in the Quality Assurance binder, biennially.

Patient Teaching

Instruct the patient as follows:

- Explain to the patient why he is receiving an arterial puncture. Relate it to his injury or disease state.
- Tell the patient that the procedure may be uncomfortable but that everything will be done to alleviate the discomfort.

References

HCE 1.32(Exposure Control) Universal Precautions
HCE 1.32 (Exposure Control) Bloodborne Pathogens

This form documents the approval and history of the policies and procedures for the Pulmonary Function Laboratory. The Medical Director signs all policies verifying initial approval. Annually thereafter, the Director and/or designee may approve reviews and revisions.

Date	Approved by:	Signature
11/07	V. Cardenas, MD Medical Director Pulmonary Laboratory	
6/09	V. Cardenas, MD No changes to the policy	
7/10	V. Cardenas, MD No changes to the policy	
2/12	A. Duarte, MD Medical Director Pulmonary Function Laboratory	

University of Texas Medical Branch	Effective Date:	Nov 90
Pulmonary Function Clinic	Revised Date:	Aug 23
Policy 04-02 ABG Sampling	Review Date:	Aug 23

No changes made to the policy

**2/13 A. Duarte, MD
Medical Director Pulmonary Function Laboratory
No changes made to policy**

**4/14 A. Duarte, MD
Medical Director Pulmonary Function Laboratory
No changes made to policy**

**8/16 A. Duarte, MD
Medical Director Pulmonary Function Laboratory
No changes made to policy**

**11/17 A. Duarte, MD
Medical Director Pulmonary Function Laboratory
Changes made to policy**

**8/19 A. Duarte, MD
Medical Director Pulmonary Function Laboratory
Changes made to policy**

**8/21 A. Duarte, MD
Medical Director Pulmonary Function Laboratory
Changes made to policy**

**10/21 A. Duarte, MD
Medical Director Pulmonary Function Laboratory
Changes made to policy**

**8/23 A. Duarte, MD
Medical Director Pulmonary Function Laboratory
Changes made to policy**