### Arterial Blood Gas Sampling

**Audience**  
All Respiratory Therapists in the Pulmonary Laboratories

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

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

- Upon completing documented instruction, and 5 supervised punctures, all Respiratory Therapists may perform arterial punctures in the Pulmonary Function Clinic under the order of a physician.
- The brachial artery shall not be used for arterial puncture unless requested by the Practice Manager 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 will analyze the sample, input the patient information into the ABG database, 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 prior to obtaining sample.**
- Staff are expected to use **Personal Protective Equipment** while performing this procedure. This includes gloves, gowns and protective eyewear). Before performing an arterial puncture for blood gas analysis, the patient interview should be complete according to the policy for patient flow through the Pulmonary Function Clinic. Through this interview, all pertinent information should be gathered to ensure patient and therapist safety during this procedure. If the patient is on supplemental oxygen and a room air arterial blood gas is desired, the patient must be removed from the oxygen for 20 minutes prior to obtaining the blood.

**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.
- Relative contraindication for arterial puncture in a patient with diagnosed Raynaud’s Syndrome.

If any of the above contraindications are noted, see the Practice Manager for further direction.

**Specimen**

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 Practice Manager 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 one minute, ideally within 10 to 15 seconds.
5. If reperfusion of the hand does not occur, collateral circulation may be inadequate. Inform the Practice Manager for further direction.

- Using aseptic technique, draw-up 0.25 cc’s of 2% Lidocaine solution with a 25 GA tuberculin syringe. This will be used for local anesthesia of the puncture site.
- Gloves must be worn for this procedure.
- Palpate the radial pulse and prep area with an alcohol swab.
- 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 cc’s of blood.
- Withdrawal needle and immediately apply pressure to the puncture site using 4x4 gauze sponge.
- 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 and will defer the sampling to another Therapist or the Practice Manager of the lab.
• 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.
• Using the one-handed technique, carefully utilize the safety device and evacuate any air from the blood sample.
• Maintain pressure on the puncture site for a minimum of 5 minutes.
• Assure bleeding has stopped.
• Analyze blood. See Arterial Blood Gas Analysis Policy and Procedure.
• Carefully discard the syringe and needle into a puncture-resistant leakproof (sharps) container. Discard gauze, alcohol and iodine swabs into a waste container.
• If patient’s PaO2 is < 60 torr, contact the patient’s physician before proceeding with the pulmonary function studies. See Arterial Blood Gas Analysis: 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.

Undesirable Side Effects / Adverse Reactions

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, administer oxygen via nasal cannula at 2 lpm, obtain vital signs and notify PFT fellow. Patient will remain in PFT Lab until vital signs return to normal.

**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.

**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.

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.