Arterial Blood Gas
Purpose

• Arterial blood gases are drawn to assess adequacy of oxygenation, ventilation, and acid-base status.
Physical findings indicating need for ABG

- Alteration in respiratory rate:
  - Less than 8 or greater than 24 in adults
  - Less than 20 or greater than 80 in newborns
  - Less than 20 greater than 60 in infants
- Unexplained alteration of pulse rate
  - Less than 60 greater than 120 in adults
- Alteration in mental status of acute onset
Normal results

- Partial pressure of oxygen (PaO2): 75–100 mm Hg
- Partial pressure of carbon dioxide (PaCO2): 35–45 mm Hg
- Oxygen content (O2CT): 15–23%
- Oxygen saturation (SaO2): 94–100%
- Bicarbonate (HCO3): 22–26 mEq/liter
- PH: 7.35–7.45.
Contraindications to Arterial Puncture

- Cellulitis or other infections over the radial artery
- Absence of palpable radial artery pulse
- Positive Allen test (see below), indicating that only one artery supplies the hand
- Coagulation defects (relative)
HAZARDS OF ARTERIAL PUNCTURE

• Pain - arterial puncture is usually more painful than venipuncture due to closeness of nerves to arteries (throbbing pain when the needle reaches the artery, possibly shooting pains to the fingers and thumb).

• Increased risk of bleeding, hematoma, thrombosis and arteriospasm.
Allen Test

• It is very important to perform *Allen Test* to confirm the patency of the ulnar artery, because in case there is no collateral flow through the ulnar artery, radial artery puncture is contraindicated.

• It can result in a gangrenous finger or loss of the hand from spasm or clotting of the radial artery.
Allen Test

• The Allen Test is performed with the patient’s hand supinated.
• At the patient's side with your fingers around the wrist; compress the tissue over both radial and ulnar arteries.
Allen Test

- Allow a few minutes for the blood to drain from the hand while the patient opens and closes her hands several times.
- Release the pressure on the ulnar artery while keeping the radial artery occluded. Normal skin color should return to the ulnar side of the palm in 1-2 seconds, followed by quick restoration of normal color to the entire palm. A hand that remains white indicates either absence or occlusion of the ulnar artery, and radial artery puncture is contraindicated.
The radial artery runs along the lateral aspect of the volar forearm deep to the superficial fascia. The artery runs between the styloid process of the radius and the flexor carpi radialis tendon. The point of maximum pulsation of the radial artery can usually be palpated just proximal to the wrist.
EQUIPMENT AND MATERIALS

• Air-tight pre-heparinized syringes
• Syringe needle (23 gauge, preferably)
• Cap
• Alcohol prep pad
• Sterile gauze
• Band-aid
• Gloves
• Prepare ice, label, biohazard bag
• Labels (complete with patient’s name, ID number, date, time, whether on room air or oxygen and rate of flow)
Procedure

• Carefully explain the need for the procedure to the patient and/or caregiver.

• Explain the steps of the procedure to the patient and/or responsible caregiver, including the risks and benefits of the procedure.

• Give the patient and/or caregiver an opportunity to ask questions

• Explain to the patient that he will need to keep his arm very still during the procedure
Procedure

1) Wash your hands
2) Put on disposable gloves.
3) Locate the approximate position of the artery by slowly rolling your index finger from side to side.
4) Have the patient dorsiflex her wrist – you may use a washcloth roll to place under the wrist.
Procedure

4) Clean the skin over the proposed site of puncture.
5) Use the forefinger and middle of your free hand to stabilize the artery.
6) With your dominant hand hold the pre-heparinized syringe and needle insert the needle into the area at 45 degrees to the skin with needle's bevel uppermost.
Procedure

7) Guide the needle slowly toward the point of maximum pulsation. When you enter the artery, arterial pressure will push blood into the syringe.

8) If no blood is obtained with these maneuvers, withdraw the needle to a position just under the skin and re-insert again. Do not probe with the needle, as this can be very painful and can lead to a hematoma, thrombus formation, and damage to the artery itself.
9) Once you have taken blood sample remove the needle from the artery and apply direct pressure over the site for 5 minutes. If the patient is on anticoagulant therapy, apply pressure for 15 minutes. Never ask the patient to apply the pressure. The patient may not apply enough pressure.
Procedure

8) While holding pressure, expel all air bubbles from the sample holding the syringe upright and allowing the bubbles to collect near the needle hub. Then evacuate it by pushing on the plunger.
Procedure

9) Carefully cap the needle with a rubber stopper. Rotate sealed syringe to mix blood with heparin.

10) Label the tube with patient's name. Place the sample in the bag containing ice and send it to the lab.

11) It is very important to return a few minutes later to check for adequate perfusion of the hand and for possible hematoma formation.
HANDLING CONDITIONS

• To store blood samples for later analysis, after obtaining the blood sample, place the syringe in ice. Blood gas values may change within five to ten minutes if the sample remains at room temperature.

• Placing the specimen on ice maintains the temperature at 1 to 5°C which will stabilize the specimen and provide reliable results for one to two hours.

• It is best that analysis of the sample be performed as soon as possible.