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Arterial Sampling

Purpose	Arterial blood gas sampling by puncture is accomplished by aseptic technique with a needle and heparinized syringe to obtain a specimen for analysis.
Scope	Respiratory Care Services obtains arterial blood samples for physiologic monitoring.
Audience	This policy applies to all personnel functioning in a clinical capacity in the Department of Respiratory Care Services.
Orders	Arterial puncture will be done at the order of the provider.
Indications	When the need to assess the patient's respiratory/metabolic status exists.
Contra-indications	<ul style="list-style-type: none"> • Negative modified Allen's Test denotes the presence of ulnar artery occlusion. • Any inflammation, infection, or poor integrity at the selected puncture site. • There is a relative contraindication for arterial puncture in the patient with diagnosed Raynaud's Phenomena.
Goals	To obtain a sampling of blood for analysis via the radial artery by puncture using an aseptic technique.
Guidelines	<ul style="list-style-type: none"> • RT is not allowed to obtain blood gas from the femoral artery. • When the radial artery site is chosen, an Allen's Test will be used to determine if collateral circulation by the ulnar artery is adequate. The results of the Allen's Test will be documented in Epic. • After blood sampling is obtained, apply pressure for a <u>minimum of five minutes</u>. If the patient continues to bleed after five minutes, has a blood dyscrasia, is anti-coagulated, or if the physician has drawn femoral gases apply pressure for a <u>minimum of ten minutes</u>. • Suctioning and/or changes in oxygen concentration or ventilator changes will precede arterial blood gas samplings by 20 to 30 minutes. • For adult patients, the request MUST include FIO₂, the time the specimen was drawn, and the patient's temperature.

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Procedure

Step	Action
1	Verify physician's order.
2	Print the test label.
3	Check the patient's record for precautions to be taken, such as in anticoagulant therapy, surgery, or trauma to hand.
4	Identify the patient using two identifiers.
5	Introduce yourself to the patient and explain what you are about to do.
6	Staff are expected to use the appropriate PPE while performing this procedure.
7	Palpate right and left radial pulses. Select the vessel with the most prominent pulse for puncture.
8	<p>Perform the modified Allen's Test on hand with the best radial pulse to ensure adequate collateral circulation.</p> <p>Modified Allen's Test:</p> <p>In the conscious, cooperative patient:</p> <ul style="list-style-type: none"> Compress both ulnar and radial arteries at the wrist to obliterate pulses. Have the patient clench and release a fist until blanching of the hand occurs. With the radial artery still compressed, release pressure on the ulnar artery. Watch for normal color to return to the hand. <p>In the unconscious patient or patient unable to cooperate:</p> <ul style="list-style-type: none"> Compress both ulnar and radial arteries at the wrist to obliterate pulses. Elevate the patient's hand above the level of his heart. Lower the patient's hand below the level of his heart. With the radial artery still compressed, release pressure on the ulnar artery. If normal color fails to appear, collateral circulation may be assumed to be inadequate. Inform the physician that

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	<p>you are unable to obtain ABG.</p> <ul style="list-style-type: none"> A positive modified Allen's Test denotes the presence of ulnar collateral flow.
9	Open the ABG collection set; remove the pre-heparinized syringe, needles, and syringe cap.
10	Assemble the syringe, keeping the chamber and tip sterile.
11	Attach the needle to the syringe, keeping the needle in a sterile protective cap.
12	Palpate the chosen radial artery as before, noting the point of maximal pulse. This will be the puncture site.
13	Stabilize the wrist in the position that presents the maximal pulse.
14	Clean the puncture site with an approved disinfectant.
15	Remove the needle cap, and at a 35-40 degree angle with the bevel in an upward position, pierce the skin at the puncture site and slowly advance the needle in one plane. Once 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.
16	After enough blood has been obtained for testing, withdraw the needle and immediately apply pressure directly on the puncture site with sterile gauze.
17	Cap the needle using the provided safety device.
18	After applying the pressure pad at the puncture site for a sufficient period, remove the pressure pad and again palpate a pulse distal to the puncture site
19	Remove the needle and cap the syringe. Dispose of the needle in the sharps container.
20	Hold the syringe vertically, gently tap the barrel, and advance the plunger until it forces air bubbles out of the syringe and blood into the cap.
21	Gently roll the syringe between the palms of your hands to

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	mix heparin
22	Scan the test label then scan the patient's hospital band. Enter the collection information into EPIC.
23	Label the syringe with the test label in the presence of the patient.
24	Place the syringe in a specimen bag and seal it closed.
25	Remove gloves. Perform hand hygiene and transport the specimen bag to the testing area,
26	Analyze the blood and call results to the physician if there are critical values or significant changes.
27	Document the notification of panic values in beaker. Click comm log, then type .crit to fill in the information. Use F2 button to scroll through each prompt. After filling in the appropriate information, click accept and verify. (<i>This will clear the blood gas from the outstanding list.</i>) It is the RT's responsibility to report critical values to the physician.
28	Document the results of the Allen Test, adverse reactions, and which radial artery was used to perform puncture in Epic.

Undesirable Side Effects	<ul style="list-style-type: none"> • Infection - Sterile technique must be used so that no pathogens will be passed directly into the patient's bloodstream. • Hematoma - Bleeding from the artery into the surrounding tissue can occur if insufficient time or pressure is applied to the puncture site. Patients on anti-coagulant therapy will be especially susceptible to the complication. • 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 (Allen's Test) before the puncture and check for a pulse distal to the site of the puncture 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.
Undesirable Side Effects	<ul style="list-style-type: none"> • Pain - Since arteries have a nerve supply and major nerves pass close to them, this procedure can prove very painful. It is always necessary to

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Continued	prepare the patient for this possibility to avoid unnecessary movement.
Assessment of Outcome	This procedure shall be deemed effective if the following criteria are met: <ul style="list-style-type: none"> • The procedure is performed with minimal pain to the patient and without permanent damage. • 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: <ul style="list-style-type: none"> • Explain to the patient why an arterial puncture is done. Relate it to injury or disease state. • Tell the patient that the procedure will be uncomfortable but that everything will be done to alleviate the discomfort. • Explain the importance of normal breathing to prevent altering the analysis.
References	<ul style="list-style-type: none"> • HCE 1.32(Exposure Control) Universal Precautions • HCE 1.32(Exposure Control) Blood Pathogens • Davis, M. D. et.al. AARC Clinical practice guidelines: Blood Gas Analysis...-respiratory care. Retrieved September 14, 2022, from https://rc.rcjournal.com/content/respcare/58/10/1694.full.pdf

Purpose To standardize Arterial Line Sampling by Respiratory Care Service Personnel. The purpose of Arterial Line Sampling is to accurately determine or reassess the cardiac performance and ventilatory status in those patients where the clinical parameters of pulse, blood pressure, color, or urine output are insufficient as a guide to cardiac or ventilatory status.

Scope

- Respiratory Care Services utilizes the blood gas results from arterial samples along with other parameters to monitor the ventilatory status of patients on ventilators.

Accountability /Training

- This policy applies to all personnel functioning in a clinical capacity in Respiratory Care Service with understanding of age specific requirements of patient population.
- A Respiratory Care Service staff member under conditions described by the policy authorizing arterial line sampling may do arterial line sampling.

Orders Sampling will be done at the physician's order or as per the specific ICU protocol. *(RT and/ or RN are capable of drawing a blood gas from an*

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arterial line.)

Indications	Arterial blood gas values may be indicated before and after the start or discontinuation of oxygen administration to the patient, after ventilator changes, and when a change in patient status has been noted.
Goal	To correctly or as accurately as possible determine and report those values being monitored which reflect patient status while at the same time working to prevent infection, infarction, and exsanguination.
Procedure	

Step	Action
1	Verify Physician's Orders and Patient ID Wash hands and wear gloves and eye shield.
2	Shut off the stopcock to the solution proximal to the intra-flow between the intra-flow and the patient.
3	Aspirate 10 cc into a sterile or inline syringe attached to that stopcock.
4	Clamp off the line between the syringe/stopcock and the "T" piece or draw from the designated inline port.
5	Swab the "T" piece with alcohol or Betadine.
6	Draw at least 1-3cc from the "T" piece or port with a sterile heparinized syringe.
7	Unclamp the line, and if less than 30 seconds, return the aspirate to the line, ensuring first that <u>no</u> air bubbles are being introduced into the system. To remove air bubbles, aspirate slightly, tap the syringe barrel, and allow the bubble to ascend away from the stopcock, then return the aspirate to the system short of returning the air bubble.
8	Turn the stopcock open to system and flush the system briefly with solution through the intra-flow.
9	Properly label sample with the date, time, and conditions of ventilation, FIO ₂ , patient temperature and tape the blood gas tag to the sample. RT should run sample within 30min of being drawn. If RT is unavailable, the RN should place

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	sample in appropriate basket (<i>the basket has RT pager on front</i>) and page the RT covering that area on appropriate pager so sample can be run promptly.
10	Close off all open stopcocks with sterile syringes, Tenckhoffs, or caps.

Complications of Arterial Lines

Major

- Local obstruction with distal ischemia
- External hemorrhage
- False aneurysm
- Dissection
- Plaque dislodgement
- Cerebral infarction (carotid artery catheter)
- Renal shut down (femoral artery catheter)
- Sepsis

Minor

- Pain
- Ecchymosis
- Temporary loss of pulse (arteriospasm)
- Local infarction
- Occlusion with ischemia
- Peripheral emboli

Assessment of Outcome

This procedure will be considered effective if it meets all the above stated goals.

Patient Teaching

The patient should be informed of the purpose of the procedure to relieve apprehension.

Infection Control/Safety Precautions

- Sterile equipment and technique will be used during set ups and change outs.
- Sterile technique will be used during care and operation around the site of insertion and at the equipment interfaces.
- Follow procedures as outlined Healthcare Epidemiology Policies and Procedures: #2.24 Respiratory Care Services.
<http://www.utmb.edu/policy/hcepidem/search/02-24.pdf>

Document

Document as outlined in Respiratory Care Services Policy & Procedure Manual

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ation

Policies # 7.1.1 and # 7.1.2.

AARC Clinical Practice Guidelines; Sampling For Arterial Blood Gas Analysis, Respiratory Care; 1992; 37:913-917

Haver VM, Eng W, Hussey JD, et al. Accuracy of electrolyte and blood gas determinations from samples collected in preheparinized syringes. Respiratory Care. 1996; 41:805-808.

Shapiro, Peruzzi Kozelowski-Templin, Obtaining Blood Gas Samples, Clinical Application of Blood Gases 5th Edition Mosby-Year Book, Inc 1994

Martin C, Auffray JP, Badetti C, et al. Monitoring of central venous oxygen saturation versus mixed venous oxygen saturation in critically ill patients. Intensive Care Medicine. 1992; 18:101-4.

Purpose

To establish a standardized procedure for performing ultrasound guided arterial blood gas (ABG) sampling in order to improve accuracy, reduce patient discomfort, and minimize complications.

Scope

This policy applies to all respiratory therapists (RTs) trained and credentialed in ultrasound guided arterial blood gas sampling within the Respiratory Therapy Department.

Orders

Sampling will be done at the physician's order or as per the specific ICU protocol.

Indications

Ultrasound guided ABG sampling will be utilized as a preferred method in situations where traditional palpation methods are difficult or have previously failed.

Goal

This method will enhance the accuracy of arterial punctures, thereby improving patient outcomes and reducing the risk of complications.

Responsibilities

1. Respiratory Therapists (RTs):
 - a. Must complete training and demonstrate competency in ultrasound guided ABG sampling.
 - b. Must adhere to this policy and standard operating procedures when performing ultrasound guided ABG sampling.
 - c. Must maintain proper documentation of the procedure, including indications, patient consent, and any complications.

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2. Supervisors/Managers:
 - a. Ensure all RTs performing ultrasound guided ABG sampling are adequately trained and assessed for competency.
 - b. Maintain records of training and competency assessments.
 - c. Monitor compliance with this policy and address any deviations.
3. Education Department:
 - a. Provide initial and ongoing training sessions on ultrasound guided ABG sampling.
 - b. Develop and update training materials as necessary.

Procedure

Step	Action
1	Verify Orders and Patient ID Wash hands and wear gloves and eye shield.
2	Confirm patient identity and explain the procedure, including the use of ultrasound, risks, and benefits.
3	Gather necessary equipment: ultrasound machine with linear probe, sterile ultrasound gel, ABG kit, gloves, antiseptic wipes, gauze, and bandage.
4	Position the patient comfortably, ideally in a supine position with the arm extended if accessing the radial artery. Ensure the limb is well-supported to minimize movement during the procedure.
5	Perform a preliminary assessment using the ultrasound to identify the best site for arterial puncture. Select a site that has a clear arterial visualization and is free from anatomical anomalies or obstructions.
6	Clean the puncture site with antiseptic and allow it to dry. Apply sterile ultrasound gel to the site and cover the ultrasound probe with a sterile cover.
7	Use the ultrasound to visualize the artery and guide the

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	needle insertion. Insert the needle at a 30-45 degree angle under ultrasound guidance, aiming for the center of the artery.
8	Observe for a flashback of arterial blood in the syringe, confirming arterial access.
9	Collect the required amount of blood, withdraw the needle, and apply immediate pressure to the puncture site for at least 5 minutes or until bleeding stops.
10	Follow steps 17-28 of arterial puncture

Training and Competen cy

Initial training will include didactic sessions, hands-on practice, and supervised clinical procedures.

Competency will be assessed through direct observation and evaluation of technique and outcomes.

Ongoing competency assessments will be conducted annually or as needed based on performance reviews.

Undesirab le Side Effects

- Infection - Sterile technique must be used so that no pathogens will be passed directly into the patient's bloodstream.
- Hematoma - Bleeding from the artery into the surrounding tissue can occur if insufficient time or pressure is applied to the puncture site. Patients on anti-coagulant therapy will be especially susceptible to the complication.
- 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 (Allen's Test) before the puncture and check for a pulse distal to the site of the puncture 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.

Undesirable Side Effects Continued	<ul style="list-style-type: none"> • Pain - Since arteries have a nerve supply and major nerves pass close to them, this procedure can prove very painful. It is always necessary to prepare the patient for this possibility to avoid unnecessary movement.
Assessment	This procedure shall be deemed effective if the following criteria are met:

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of Outcome	<ul style="list-style-type: none"> The procedure is performed with minimal pain to the patient and without permanent damage. <p>The results of analysis are interpreted by qualified medical personnel and appropriate adjustments in the patient's care are made as needed.</p>
Patient Teaching	<p>Instruct the patient as follows:</p> <ul style="list-style-type: none"> Explain to the patient why an arterial puncture is done. Relate it to injury or disease state. Tell the patient that the procedure will be uncomfortable but that everything will be done to alleviate the discomfort. <p>Explain the importance of normal breathing to prevent altering the analysis.</p>
References	<ul style="list-style-type: none"> HCE 1.32(Exposure Control) Universal Precautions HCE 1.32(Exposure Control) Blood Pathogens Davis, M. D. et.al. AARC Clinical practice guidelines: Blood Gas Analysis...-respiratory care. Retrieved September 14, 2022, from https://rc.rcjournal.com/content/respcare/58/10/1694.full.pdf