HEALTH HOLDING

HAFER ALBATIN HEALTH CLUSTER
MATERNITY AND CHILDREN HOSPITAL

Department:	Neonatal Intensive Care Unit (NICU)		
Document:	Multidisciplinary Policy and Procedure		
Title:	Obtaining Arterial Blood Gas Samples for Neonate		
Applies To:	All NICU Staff, Respiratory Therapists and Biomedical engineers		
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1. PURPOSE:

1.1 Sampling for arterial blood gases determination.

2. DEFINITIONS:

2.1 **Percutaneous arterial puncture** to obtain arterial blood for analysis of blood gases or rarely for routine laboratory tests if venous and capillary sampling are unobtainable e.g. lifesaving situations.

2.2 Abbreviations:
ABG: arterial blood gases, **PPHN**: persistent pulmonary hypertension.

3. POLICY:

3.1 Performing arterial puncture needs a physician's order.

3.2 Indicated for analysis of ABG in the following circumstances:
- 3.2.1 Catheterization of the umbilical artery is not possible for technical or clinical reasons
- 3.2.2 Required sampling is infrequent
- 3.2.3 Course of illness is expected to be short
- 3.3.4 Preductal ABG is required e.g. PPHN,
- 3.3.5 Rarely indicated for routine laboratory tests when venous and capillary samplings are unobtainable

3.3 Contraindications:
- 3.3.1 Coagulation defects and thrombocytopenia
- 3.3.2 Inadequate collateral flow from ulnar artery
- 3.3.3 Circulatory compromise in the extremity
- 3.3.4 Infection in sampling area

3.4 Site:
- 3.4.1 Peripheral artery is preferred.
- 3.4.2 Radial artery is preferred if ulnar collaterals are intact.
- 3.4.3 Brachial artery is used only for urgent life threatening indications. Has higher incidence of Complications.
- 3.4.4 Avoid temporal artery because of risk of neurologic damage.

3.4 Maximum 2 attempts are allowed per person. If after 2 attempts the assigned nurse is not successful, she informs the specialist on duty who can perform it himself or assigns the resident on duty to do it.

3.5 Analgesia; arterial puncture is a painful procedure. Follow neonatology guidelines for pain management before the procedure.

3.6 Be aware of the possible complications and ensure taking the steps to prevent them (Table 1).

Table 1. Complications of arterial stab attempts and how to prevent them

Complication	Causes	Prevention
Impaired circulation of hand	Severe trauma to vessel due to repeated use of same site	Alternate sites & discontinue use of traumatized site
Scar tissue	Repeated use of same site	Alternate sites & discontinue use of traumatized, scarred site.
Hemorrhage, bruising and hematoma formation	Insufficient pressure or pressure applied for insufficient period of time.	Apply firm pressure over puncture site for a minimum of 5 minutes.
Nerve injury: (a) Radial nerve (b) median nerve	a Puncture site too high on forearm, thereby puncturing radial nerve. b. Puncture site not in the center of the lateral 1/3rd of the anterior aspect of the wrist.	- Ensure puncture site is between skin folds of wrist. -Ensure puncture site is in the center of the lateral 1/3rd of the wrist.
Bone injury, inflammation Osteomyelitis, Fractures	Inadvertently puncturing bone and improper restraining techniques	Ensure appropriate depth and location of puncture; use appropriate restraining technique, ensuring joint is supported.
Local or systemic infection	Poor aseptic technique	Use of proper aseptic technique. Including cleansing and maintaining sterility of needle.
Temporary Blanching in affected extremity	Transient arterial spasm likely related to excessive suction pressure may also indicate occlusion or absence of ulnar artery	Use minimal suction pressure on syringe and allow blood to flow freely

4. PROCEDURE:

4.1 Explain procedure to parents if available.
4.2 Ensure that the ABG machine is functioning correctly before obtaining sample
4.3 Document the patient general condition, inspired FiO2, 02 saturation and temperature.
4.4 Assemble equipment.
4.5 Provide non-pharmacologic and/or pharmacologic pain management as required
4.6 Steps of Performing Arterial Puncture for Blood Sampling
- 4.6.1 Assemble equipments, heparinize syringe and expel any air bubbles from syringe. Excessive heparin in syringe causes falsely low PCO2, & pH (heparin solution has acidic pH), air bubbles equalize with atmospheric air and causes false $\uparrow PO_2$&$\downarrow PCO_2$.
- 4.6.2 Wash hands and don gloves. Hand washing reduces transmission of infection. Gloves provide a barrier against blood borne diseases.
- 4.6.3 Extend wrist supine. Clean the area with alcohol swabs. Hyperextension of wrist may occlude vessel.
- 4.6.4 Perform Allen's test for collaterals:
  - 4.6.4.1 Elevate infant hand
  - 4.6.4.2 Occlude both radial & ulnar arteries at wrist,
  - 4.6.4.3 Massage palm toward wrist
  - 4.6.4.4 Release occlusion of ulnar artery

4.6.4.5 Look for color return to hands in <10 seconds, indicates good collaterals
4.6.4.6 Do not puncture the site if color return takes more than 15 seconds

4.6.5 Locate artery by palpation. Radial puncture site is between skin folds of wrist in the center of the lateral 1/3rd of the wrist. Inappropriate puncture site can cause damage to ulnar or median nerves.

4.6.6 Position needle against direction of blood flow, keep angle of entry at 15-25° with bevel down. Use fresh needle & repeat skin preparation if withdrawal from skin is necessary.

4.6.7 While maintaining gentle suction, advance until there is blood return or resistance from bone. If no blood is obtained prior to encountering resistance withdraw needle cautiously until blood return.

4.6.8 Collect sample and withdraw needle. Label sample. If sample is for ABG, expel any air bubbles, cap the needle, put it in ice container & ensure no delay for analysis.

4.6.9 Compress site for 5 full minutes or until haemostasis is complete.

4.6.10 Check distal circulation after puncture by arterial pulse, capillary refill time, color (cyanosis or pallor) & temperature. Inform specialist on duty immediately if any abnormality is notice.

4.6.11 Document procedure in the progress notes indicating date, time, site, person who performed it and any effects on distal circulation.

5. MATERIAL AND EQUIPMENT:

5.1 Gloves
5.2 23 or 24 gauge needle
5.3 Syringes (1 ml).
5.4 0.05 ml of heparin (1:1000)
5.5 Sterile germicide (isopropyl alcohol 70%)
5.6 Cup or kidney basin with crushed ice.
5.7 Gauze pads or cotton balls

6. RESPONSIBILITIES:

6.1 Physician
6.2 Nurse
6.3 Respiratory therapist
6.4 Biomedical engineers to ensure ABG machine maintenance

7. APPENDICES:

N/A

8. REFERENCES:

8.1 McDonald M, Eichelberger M; Peripheral Arterial cannulation. Atlas of Procedures in Neonatology. Fourth edition. 2012, 89-92.

8.2 Blood sampling. Radial artery puncture and catheterization. The Harriet Lane Handbook, 18th edition, 2008.

9. APPROVALS:

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