Ashford and St. Peter's Hospitals
NHS Foundation Trust

Arterial Blood Gas (ABG) sampling via needle puncture for Specialist Nurses and Allied Health Professionals

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History

Issue	Date Issued	Brief Summary of Change	Author
1	21 April 2021	New Policy	Filipe Alves

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Executive summary

Arterial Blood Gas (ABG) sampling provides valuable information to monitor the acid-base balance at a specific point in the course of critically ill patients and it is an essential component of the assessment of patients who may require long-term oxygen therapy (Royal College of Physicians, 1999).

This procedure will help to determine the severity of the condition and can help to diagnose a disease. The respiratory status and acid-base equilibrium of individuals with pulmonary disorders, drug overdose, and metabolic disorders may be evaluated through this procedure.

ABGs sampling has traditionally been the role of the doctor, however with the development of new ways of working and by using an education and training approach along with a competency-based assessment, specialist Nurses and AHP can perform this extended role and support the patient's assessment and clinical management.

The British Thoracic Society (2002) guidelines recommend that staff providing non-invasive ventilation treatment should be able to carry out ABG sampling, rather than relying on doctors.

This policy covers ABG sampling process and procedures for Specialist Nurses and AHPs.

Contents

Appendices

See also: Aseptic technique policy
Standard Precautions Policy
Sharps Policy/ Needle Stick

1. Introduction

1.1. Arterial blood gases are taken to evaluate the patient's:

- Oxygenation
- Ventilation
- Acid base balance

Arterial blood gas samples are usually obtained from a single percutaneous needle puncture into a peripheral artery although those who require frequent sampling may have an indwelling catheter in situ. Those patients who are in a critical or unstable condition may require a sample to be drawn from more central arteries such as the brachial or femoral; these central sites can only be undertaken by suitably trained medical staff.

1.2 Key measurements in Arterial Blood Gas Analysis

1.2.1 Measured parameters

- pH – Hydrogen ion concentration
- PaO2 – Oxygen tension
- PaCO2 – Carbon Dioxide tension

1.2.2 Calculated parameters

- HCO3 – Bicarbonate concentration
- BE – Base excess
- SaO2 – Oxygen concentration

1.3 The importance of Arterial Blood Gases (ABG) in both diagnosis and monitoring of a patient's condition cannot be overstated, but the sampling procedure has potential complications. It is therefore necessary that the Practitioner is fully aware of all known implications. Further to this, since ABG results often direct the management of a patient's condition, the practitioner must be aware of the need for accuracy in the sampling procedure. Finally, the fact that the procedure is invasive and often painful must be borne in mind when deciding to undertake ABG sampling.

2. Scope

2.1 This guidance is relevant to: Clinical Site Nurse Practitioners, Critical Care Outreach Nurses and Senior Respiratory Physiotherapists.

3. Purpose

3.1 The purpose of this framework is to identify the Trust's expectations for safe and effective practice. It provides a systematic and robust process for ensuring that the practice of all practitioners regardless of role is consistent, safe and meets Trust and national requirements.

3.2 Arterial Blood Gas (ABG) sampling, and the procedure of taking an ABG, has become a necessary skill for certain groups of clinically based staff.

4. Explanation of Terms Used

4.1 Aseptic Non-Touch Technique (ANTT) - clinical practices used to protect the patient from microorganisms by preventing contamination of wounds, manipulated devices and other susceptible sites. Aseptic technique involves the use of appropriate hand hygiene, use of sterile equipment, no touch technique and robust patient skin/site disinfection.

4.2 ABG- Arterial Blood Gas

4.3 PPE- Personal protection equipment

4.4 Healthcare professional - a registered or trained member of staff including but not exclusively nurses, doctors, healthcare assistants and operating department practitioners.

4.5 Infection - entry of a harmful microbe into the body and its multiplication in the tissues.

4.6 Thrombosis - formation, development or existence of a blood clot within the vascular system.

5. Duties and responsibilities

5.1 Chief Executive – The Chief Executive has overall responsibility for the strategic and operational management of the Trust ensuring there are appropriate strategies and policies in place to ensure the Trust continues to work to best practice and complies with all relevant legislation in regard to arterial blood gas sampling.

5.2 Chief Nurse - The Chief Nurse will ensure that the Divisional Directors take clinical ownership of the policy, ensuring it is available locally.

5.3 Divisional Chief Nurse - The Divisional Directors will ensure that all staff comply with this policy and that all staff attend mandatory infection prevention and control training. They are responsible for ensuring adequate facilities and resources are available to adhere to this policy.

5.4 Clinical Leads - The Clinical Leads will ensure that the current version of this policy is available in all of their areas. They will ensure that all staff comply with this policy and that all health care workers attend mandatory infection prevention and control training.

5.5 Infection Prevention and Control Team (IPCT) – The IPCT will act as a resource for information and support. They will provide education in relation to Infection control relating to this policy which includes PPE and mandatory training. Clinical Skills will monitor the implementation of this policy via audit within clinical areas and be responsible for regularly reviewing and updating it.

5.6 Nursing & Physiotherapy Staff – Nursing and physiotherapy staff will be permitted to practice ABG sampling only if identified as required for their role, as described on the target audience, and have been deemed competent to do so.

5.7 All Trust employees - All Trust employees will comply with this policy and inform the Policy Authors of any issues or concerns relating to the policy.

6. Clinical Need and Practice

6.1 Clinical statement

The site of puncture will be restricted to the radial artery because:

- The artery is relatively near the surface of the arm
- The artery is relatively easy to palpate and stabilise
- The artery normally has a good collateral blood supply

6.2 Criteria for the performance of ABG sampling

- Practitioners will have successfully completed their ANTT and IPC training.
- Practitioners will successfully complete local and relevant training, and be considered competent in performance of the procedure, or be able to provide evidence of previous training.
- Practitioners are required to demonstrate knowledge of potential dangers and complications associated with the procedure. In addition the practitioners will need to demonstrate knowledge of the signs and symptoms of associated complications, and be able to identify appropriate actions to safeguard the patient.
- Designated practitioners should ensure that in fulfilling this role they are working within the guidance set out by their regulatory body (NMC: The Code; CSP: Professionals Values Code).

6.3 Criteria for Inclusion

Below is list of clinical situations/ conditions where performing and ABG sampling may be appropriate:

- Critically ill patients
- Unexpected or inappropriate hypoxaemia (SpO2 <94%) or any patient requiring oxygen to achieve this target range
- Deteriorating oxygen saturation or increasing breathlessness in a patient with previously stable chronic hypoxaemia (e.g. COPD)
- Any previously stable patient who deteriorates and requires a significantly increased fraction of inspired oxygen to maintain constant oxygen saturation
- Any patient with risk factors for hypercapnic respiratory failure who develops acute breathlessness, deteriorating oxygen saturation or drowsiness or other symptoms of CO2 retention
- Breathless patients who are thought to be at risk of metabolic conditions such as diabetic ketoacidosis or metabolic acidosis due to renal failure.
- Any other evidence from the patient's medical condition that would indicate that arterial blood gas results would be useful in the clinical situation

6.4 Criteria of Exclusion

- A negative Allen Test
- Infectious skin process at or near the puncture site
- Current thrombolysis therapy (except in medical emergencies)
- Impaired circulation (e.g. Raynaud's Disease)
- Arteriovenous fistula
- Distorted anatomy/ trauma/burns to the limb - at or proximal to the attempted arterial puncture site
- History of arteriospasm
- Severe coagulopathy (except in medical emergencies)

6.5 Cautions

- Medium or high dose anticoagulation therapy, or history of a clotting disorder
- Patient on Oral Anti-coagulation (e.g. Warfarin)
- Intra-dermal Low molecular weight Heparin
- History of a clotting disorder (discuss with medical team responsible for the patient)
- Severe peripheral vascular disease (discuss with medical team responsible for the patient)
- Thrombolysis in the past: 24 hours (Alteplase) OR: 4 hours (Tenecteplase)

6.6 Potential Complications

- Haematoma
- Arteriospasm
- Air or clotted blood emboli
- Anaphylaxis from local anaesthetic agent
- Introduction of a contagion at sample site and consequent infection in patient
- Haemorrhage
- Trauma to the vessel
- Arterial occlusion
- Vaso-vagal response
- Pain

7. Sampling Procedure

7.1 The table below describes the appropriate procedure prior to the sampling of arterial blood gas via a needle aspirate:

Pre Sampling	
Action	**Rationale**
Identify clinical need for an ABG	To prevent inappropriate sampling and exposure to associated risks.
Collect equipment needed including: • ABG syringe • Gauze and tape • Chlorhexidine skin preparation • Dressing trolley (Cleaned) • Non pulp, cleanable tray or trolley • Clean gloves/ apron • Sharps box • May require local anaesthetic	To ensure the procedure is carried out safely, with minimal infection risk, timely and without interruption.
Wash hands with soap and water as per the Trust Hand Hygiene Policy and apply appropriate PPE, non-sterile gloves and apron.	To reduce the risk of infection
Identify patient by surname, first name, date of birth. Check for any chlorhexidine known allergies.	To ensure correct identification of the Patient and reduce the risk of an allergic reaction.
Explain the procedure and gain consent	To ensure patient has consented and improve compliance
Clean wipe able tray/ trolley with Clinelle wipes if visibly soiled, or alcohol wipes if visibly clean. Open equipment into the clean tray/ trolley tray.	To reduce the risk of infection
Explain to the patient the importance of keeping the site visible and clean	To ensure patient compliance and reduce risk of blood loss or infection
PERFORM ALLEN TEST • Ask the patient to make a tight fist • Apply direct pressure to both the radial and ulna arteries • Ask the patient to clench and unclench fist until blanching of the skin occurs • Release pressure over the ulna artery; observe the colour of the fingers, thumb and hand.	**The Allen test is performed to ensure that adequate collateral blood supply is provided via the ulna artery** **Positive result:** the fingers and hand should flush within 15 seconds **Negative result:** flushing does not occur
Consider the use of local anaesthetic agent, and administer as prescribed if appropriate. Standard sharps and PPE precautions will need to be undertaken.	To reduce pain at the point of insertion and reduce risk of infection/ injury.

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APPENDIX 2: EQUALITY IMPACT ASSESSMENT

Equality Impact Assessment Summary

Name and title: Filipe Alves, CSNP Team Leader
Policy: Arterial Blood Gas (ABG) sampling via needle puncture for Specialist Nurses and Allied Health Professionals

Background
The aim of this policy is to give clear and concise guidelines on how to perform Arterial Blood Gas sampling via a needle puncture as the Trust would accept as best practice using current evidence. The ABG sampling allows both the diagnosis and monitoring of a patient's clinical condition and can support changes on the patient's clinical management. This policy is relevant to the all staff allowed to perform this procedure.
Methodology
This policy is aimed to a particular group of people, above described as target audience. It encompasses all patients within the same group. The Policy itself is created from using best practice guidelines, national guidelines and Trust policies. This policy extends to cover and will be applied fairly and consistently to all Ashford and St Peters NHS Foundation Trust employees (as per target audience) and patients regardless of their protected characteristics as defined by the Equality Act 2010 namely age, disability, gender reassignment, race, religion or belief, sex, sexual orientation, marriage or civil partnership, pregnancy and maternity, length of service, whether full or part-time or employed under a permanent or a fixed-term contract, irrespective of job role or seniority within the organisation.
Key Findings
Where an individual has difficulty in communicating, whether verbally or in writing, arrangements will be put in place as necessary to ensure that the processes to be followed are understood and that the individual is not disadvantaged during the application of this policy and related procedures.
Conclusion
In conclusion this policy offers a set guideline for ABG sampling via needle puncture for healthcare practitioners who may undertake this task in their role. Staff must adhere to this policy as it is set out to ensure safe practice for themselves and their patients.
Recommendations
There should be no changes made to policy following the Equality Impact Assessment process but the guidelines will continue to be reviewed every two years.