



# All Wales Blood Gas Sampling Guideline- Capillary and Arterial

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<b>Brief Summary of Document:</b>	The purpose of this guideline is to outline the minimum standard for Blood Gas Sampling – capillary and arterial for Respiratory Practitioners in primary, community and secondary care settings.				
<b>Scope</b>	The procedures must be followed by all HealthCare Professionals involved in the provision of blood gas sampling within secondary, primary and community care. All registered healthcare professionals must have been identified with an agreed mentor/tutor. Training includes completion of the National Welsh standard course or a recognised course which includes capillary blood gas sampling as part of the formal content , completion of a portfolio, completed at least 10 successful supervised attempts and I-STAT, other analyser training.				
<b>To be read in conjunction with:</b>	<ul style="list-style-type: none"> <li>- Record Keeping for Nurses and Midwives Policy</li> <li>- Health Records Management Policy</li> <li>- Risk management Strategy &amp; Policy</li> <li>- Infection control policy</li> <li>- Consent Policy</li> <li>- NMC Code of conduct</li> </ul>				
<b>Owning committee/group</b>	All Wales Respiratory Health Implementation Group				

Reviews and updates		
Version no:	Summary of Amendments:	Date Approved:
1	New Procedure	

## Glossary of terms

Term	Definition
$P_aO_2$	Partial pressure of Oxygen
$P_aCO_2$	Partial pressure of Carbon Dioxide
pH	Unit of measurement of acidity of blood
$HCO_3$	Bicarbonate
$SaO_2$	Percentage of Haemoglobin saturated with oxygen ( $HbO_2$ ) compared to the percentage of unbound haemoglobin (direct blood measurement).
$SpO_2$	Pulse oximetry. (As $SaO_2$ but indirect measurement)
NIPPV	Non Invasive Positive Pressure Ventilation
LTOT	Long term Oxygen Therapy
ABG's	Arterial Blood gases
EBG	Earlobe blood gases
NOT	Nocturnal Oxygen Therapy
AOT	Ambulatory Oxygen Therapy
SBOT	Short Burst Oxygen therapy
HOS Team	Home Oxygen Service Team
POCT	Point Of Care Testing
DOAC	Direct Oral Anticoagulation
SpR	Specialist Registra

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## 1. AIM

Arterial blood gases (ABG's) represent the 'gold standard' method for acquiring patients' acid base Status (Honarmand 2006). Arterial blood sampling potentially can cause spasm, intraluminal clotting, bleeding, haematoma formation and transient obstruction of blood flow.(Williams 1998).

Patients often report this procedure as a painful and unpleasant experience (Crawford 2004).

Earlobe blood gas (EBG) sampling is a useful alternative to ABG's. Properly obtained capillary blood samples accurately reflect arterial blood gas measures of PO<sub>2</sub>, PCO<sub>2</sub> and pH (Murphy 2001, Wimpress et al 2005, Zavorsky et al 2007).

BTS (2017) maintain that for most patients who require blood gas sampling, either ABGs or arterialised CBG may be used to obtain an accurate measure of pH and partial pressure of carbon dioxide (PaCO<sub>2</sub>). However, the partial pressure of oxygen (PaO<sub>2</sub>) is less accurate in earlobe blood gas samples especially when on high flow oxygen (FiO<sub>2</sub> >20kPa) (it underestimates the PaO<sub>2</sub> by 0.5–1 kilopascal (kPa). Therefore, oximetry (oxygen saturations) should be monitored carefully if earlobe blood gas specimens are used and an ABG should be taken if possible if there is any concern about the accuracy of a CBG.

## 2. OBJECTIVES

The purpose of this procedure is to provide a clear framework to enable all healthcare professionals to:-

- Demonstrate competence in ear lobe capillary blood gas sampling
- Demonstrate understanding of normal blood gas readings and identify according to guidelines those who need LTOT, AOT or NIPPV (NOT as long as on NIV) (SBOT only recommended for Cluster headaches).
- Demonstrate the ability to undertake all appropriate quality control measures.
- Demonstrate the ability to recognise abnormal readings and to seek medical advice.
- Standardised the procedure to reduce variation in results.

**See Appendix 1 for competency assessment form**

## 3. SCOPE

This procedure must be followed by all healthcare professionals involved in the provision of assessing patients for long term oxygen therapy within secondary and community care in Wales. Earlobe capillary blood gas sampling is only to be performed by registered healthcare professionals after appropriate training (RGN, HCSW).

The recommendation is that Respiratory Practitioners in secondary, primary and community care settings complete a recognised course which includes capillary blood gas sampling as part of formal content, attend an in house practical training of ELCB sampling, complete a portfolio of case studies and must have successfully completed 10 supervised attempts, of which the last 5 should be sequential before they can act independently. Point of care training will need to take place to obtain a practitioner bar code for I-STAT/ other analyser use. Each practitioner undertaking the package of training will have a mentor tutor who is registered on the ICST website and agreed by the All Wales Lead for Home Oxygen.

#### 4. PROFESSIONAL AND LEGAL ISSUES

The NMC Code (2015) requires that you practice according to a number of competence related standards of practice and behaviour for example:

6. *Always practice in line with the best available evidence*

6.2 *maintain the knowledge and skills you need for safe and effective practice*

13. *Recognise and work within the limits of your competence*

13.3 *Ask for help from a suitably qualified and experienced healthcare professional to carry out any action or procedure that is beyond the limits of your competence*

13.5 *Complete the necessary training before carrying out a new role*

The Health and Care Professions Council (HCPC) Standards of Conduct, Performance and Ethics (2014) state that as a professional:

*“You must act within the limits of your knowledge, skills and experience and, if necessary, refer the matter to another practitioner and that you must communicate properly and effectively with service users and other practitioners.”*

**(Other practitioner groups need to abide by their regulatory body code of conduct)**

#### 5. BACKGROUND TO THE TEST

##### a) Introduction

This procedure outlines the All Wales guidance for the undertaking of earlobe capillary blood gas sampling. It is intended as a guide to practice but does not remove the need for clinical judgement when carrying out a procedure.

Capillary blood gases are taken to evaluate the patient's:

- Oxygenation
- Ventilation
- Acid base balance

Capillary blood gas samples are usually obtained from the earlobe.

##### Key measurements in Capillary Blood Gas analysis:

Measured parameters

- Hydrogen ion concentration – pH
- Oxygen tension – PaO<sub>2</sub>
- Carbon dioxide tension – PaCO<sub>2</sub>

Calculated parameters

- Bicarbonate concentration HCO<sub>3</sub>
- Base Excess
- Oxygen concentration

Normal arterial blood gas values	
PaO <sub>2</sub>	>10.6kPa
PaCO <sub>2</sub>	4.7-6.0kPa
pH	7.35-7.45
HCO <sub>3</sub>	24-30mmol/L
SaO <sub>2</sub>	≥95%
TCO <sub>2</sub>	23-27mmol/L (arterial) 24-29mmol.L (Venous).

**b) There are a number of indications for capillary blood gas analysis:**

- Anyone with an acute exacerbation of a chronic chest condition
- Anyone with impaired respiratory effort
- Patients with a low SpO<sub>2</sub> (less than 92%) at rest
- An outpatient non-urgent assessment of blood gases (arterial blood gases commonly used in an emergency department)
- Respiratory failure (acute or chronic)
- Respiratory, metabolic or mixed acid base disturbances, with or without compensatory mechanisms
- Ventilated patients (check sufficient pressures/ volume settings to maintain blood gases)
- Diagnostic test requiring multiple blood gas results, where SpO<sub>2</sub> does not give enough information and there is no trained staff to place insert an arterial cannula (e.g. cardiopulmonary exercise testing, long term oxygen therapy, ambulatory oxygen therapy assessment)
- To assess supplementary oxygen requirements for home oxygen
- To identify ketoacidosis or acute poisonings

**c) Referrals**

Referrals can be accepted from any registered health care professional within in each Health Board following local procedures.

**6. Equipment & Preparation for Testing****Equipment**

- Heparinised Capillary blood gas tube
- Alcohol swab
- Sharps box
- Patient label /notes/NHS number
- Gloves
- Absorbent towel
- Appropriate lancet
- Clean plastic tray or disposable cardboard tray
- Hot water supply
- Sterile gauze
- Waterproof plaster
- Appropriate analyser
- Saturation probe

**a. Contraindications**

Capillary sampling should not be performed where there is:

- Inflamed, swollen or oedematous tissue
- Cyanotic or poorly perfused tissues
- Localised areas of infection
- Patient with shock

## Relative contra-indications

- Severe clotting or bleeding disorder
- Anti-coagulation therapy with uncontrolled INR

**Contraindications are relative and sometimes the need to perform the test will override the risks to the patient procedure. At these times guidance from a Respiratory Physician should be sought.**

### b. Health & Safety

#### General considerations.

All staff are reminded of general Health Board Health & Safety policies available on the intranet.

### c. Infection Control

- **General considerations.** All staff are reminded of general Health Board Infection Control policies available on the intranet.
- **Cleaning & disinfection of equipment.** I-STAT machine cleaned regularly in accordance with manufacturer's guidance. *Other analysers cleaned as per local guidance.*
- **Cartridges**
  - Store in the fridge (temperature of fridge checked and documented as per local policy)
  - Check temperature control maintained on delivery, document receipt.
  - Check expiry date
  - Use at room temperature.
  - Once removed from fridge use within 2 months do not return to fridge, document new expiry date on Cartridge

### d. Quality control.

- Each I-STAT analyser should undergo a quality control using the simulation daily/before each test/session.
- Every new batch quality control using aqueous control solutions level 1 and 3
- External monthly quality control via Biochemistry department.  
*Other analysers will have different quality control procedures*
- **Pre-Test Instruction**
- **Insert user code** – 5 digit code if needed (not to be shared)
- **Assess the patient for contra-indications to earlobe capillary blood gas sampling.** It should not be assumed that these have already been assessed by the referrer, and for some patients a degree of clinical judgement will be required in interpreting contraindications. Ensure the patient is not allergic to the vasodilator cream
- **Document patient demographics** & enter required values into the I-STAT/other machine. Hospital Number or identifiable number in case further sampling is needed. Age and gender – selecting the appropriate reference values if necessary.
- Cartridge and operator code.

- **Explain the procedure** to the patient so that they understand what is required to obtain the earlobe capillary blood gas sample.

### 7. Performing Earlobe Capillary Blood Gases

ACTION	RATIONALE
Explain the test procedure to the patient Obtain verbal consent	To obtain informed consent and co-operation
Ensure saturations probe is attached via finger or ear probe to monitor the SpO <sub>2</sub> whilst taking the sample	Ensure sample is arterial end of capillaries as opposed to venous end
Wash hands and put on protective gloves	To reduce the risk of nosocomial infection and avoid contamination of blood sample
Position the patient in a comfortable position with easy access to either earlobe.	To decrease the risk of vasovagal response
Remove any earrings from the ear  (the left ear is the most convenient side for sample taking for right handed technicians)  Pin back hair if necessary	To identify the most appropriate site
Clean the site to be use for sampling With and alcohol swab and allow to dry	To reduce risk of infection
Place absorbent towel over the patients shoulder	To protect patient's clothing from blood spillage
Apply vasodilator cream liberally to earlobe, <b>*(Deep Heat Cream is recommended.)</b> or use gauze soaked in warm water (no more than <b>42°C</b> ) and applied for 3-5 min prior to puncture.  Leave on until ear becomes red and warm ( can take up to 20 minutes)	To increase ear lobe blood flow (arterialised capillary blood sample) this reducing the arteriovenous oxygen content differences (Hughes 1996.)
Wipe off cream and rub earlobe vigorously with gauze.	To stimulate circulation and remove traces of cream
Hold earlobe firmly in place using a lancet stab the ear on a fleshy part of the lobe (towards the edge if possible) <b>to a depth of 3mm.</b>	To obtain the arterialised capillary blood sample.  To avoid piercing the other side.
Blood flow from the puncture site should flow freely. Blood flow can be encouraged by stroking the earlobe gently DO NOT squeeze the ear. If blood flow insufficient stab again.	To avoid haemolysis of the sample i.e. the rupture of red blood cells, thus releasing their content into the plasma
Always wipe away the first drop of blood	To avoid contamination with tissue fluid
Collect blood in a heparinised capillary tube by holding the tube with one end in the well of blood.  Fill capillary tube to black line.	To aid capillary tube filling.  To obtain adequate sample for testing Activates the heparin in the tube and prevents clotting of the sample.

<p>Gently rotate the capillary tube whilst obtaining blood sample</p> <p>The tube should be held horizontally or with the end in the well of blood angled slightly downwards.</p> <p>Ensure there are no bubbles or gaps.</p>	<p>Air bubbles result in gas equilibration between the air and the arterial blood leading to a decrease in PaCO<sub>2</sub> (Williams 1998)</p> <p>Prevents blood from clotting.</p>
<p>Cover the wound front and back with a piece of gauze and ask the patient to apply pressure until the bleeding stops.</p> <p>Sometimes a swab soaked cold water may be needed.</p> <p>Apply waterproof dressing to procedure site if indicated.</p>	<p>To decrease the risk of bruising and bleeding</p> <p>To stem the flow of blood if the patient is prescribed <b>Aspirin, a DOAC, or Warfarin</b></p> <p>To avoid risk of infection</p>
<p>Insert the tube into the cartridge well using the plunger insert the required amount of blood.</p> <p>Fold the flap over the well and snap into place.</p>	<p>To ensure the cartridge is not broken or contaminated</p>
<p>Insert the cartridge into the analyser port, holding on its sides.</p> <p>Follow the instructions on the machine and wait for results.</p> <p>Prior to removing cartridge identify on machine arterial or capillary sample</p> <p>Remove cartridge</p> <p>Dispose of all sharps/cartridge into sharps box.</p>	<p>Ensure accurate recordings</p> <p>Single use only</p>
<p>Note results and outcome in patient's notes.</p>	<p>To maintain effective communication</p>

\***Deep Heat cream** is not licensed for use for the purpose of obtaining an arterialised capillary ear lobe blood sample. The use of deep heat cream in this way has been well documented and is common practice throughout healthcare systems when undertaking this procedure. Use of the cream is contraindicated in patients with known sensitivity to the product or any of ingredients. It should not be applied to broken or sensitive skin. The cream is a rubefacient and reddening of the skin will occur within a few minutes. This erythema does not indicate intolerance. Patients are advised against excessive exposure to sunlight to avoid potential of photosensitivity. Reported undesirable effects have taken the form of localised sensitisation reactions have invariably subsided following the withdrawal of the medication.  
(Not combustible, however following evaporation of aqueous component residual material can burn if ignited).  
[www.medicines.org.uk](http://www.medicines.org.uk).

- **Interpreting and Reporting of Results**

Earlobe capillary blood gas sampling should only be conducted by a trained and assessed Health Care Professional. Documentation of attendance at a course and completion of required competencies should be noted in personnel files.

- **Reporting the earlobe capillary blood gas results**

Any deviations from criteria for preparation and performance of test (outlined above) should be reported to line manager/ POCT / Consultant dependent on the issue.

- **Storing and communicating the results**

- Each I-STAT machine can store 4000 results/ other analysers may be different.
- Each operator has a unique number (not to be shared)
- Use printer or write results immediately into patient notes
- Always check sample is from the correct patient
- Write patients name on hard copy
- Each patients NHS number should be used so results can be stored and recalled for future reference if required

## REFERENCES

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# Guideline for radial arterial blood gas sampling by Respiratory Health Care Professionals in a Hospital Setting.

Adapted from O'Neil D. (2002) Gwent Healthcare NHS Trust / ACJ 2013.

## **Introduction.**

Arterial blood gases (ABG's) represent the 'gold standard' method for acquiring patients' acid base status (Honarmand 2006). Arterial blood sampling potentially can cause spasm, intraluminal clotting, bleeding, haematoma formation and transient obstruction of blood flow (Williams 1998).

Arterial blood gas sampling is integral to, managing patients within the respiratory service in the hospital setting. The respiratory practitioners will aim to collect radial arterial blood gas samples. The purpose will be to assess either respiratory or metabolic acid base status, either prior to commencing or during respiratory specific therapies in the hospital setting.

## **Aim.**

- ✓ To facilitate accurate assessment.
- ✓ To aid prompt delivery of appropriate treatment.
- ✓ To assess the efficiency of treatment.
- ✓ To assess in an unexpected deterioration in an unwell patient.

<b>Normal arterial blood gas values</b>	
PaO <sub>2</sub>	>10.6 kPa
PaCO <sub>2</sub>	4.7-6.0 kPa
pH	7.35-7.45
HCO <sub>3</sub>	24-30 mmol/L
SaO <sub>2</sub>	≥95%
Base Excess	-2 to +2

Oxford Handbook of Clinical Medicine 6<sup>th</sup> edition

## **Objectives.**

The objective of this protocol is to outline the necessity for taking radial arterial blood gas samples by appropriately trained respiratory practitioners during the assessment and treatment of patients with chronic respiratory conditions.

## **Guideline.**

The respiratory practitioner will assess the necessity prior to undertaking the blood gas sample.

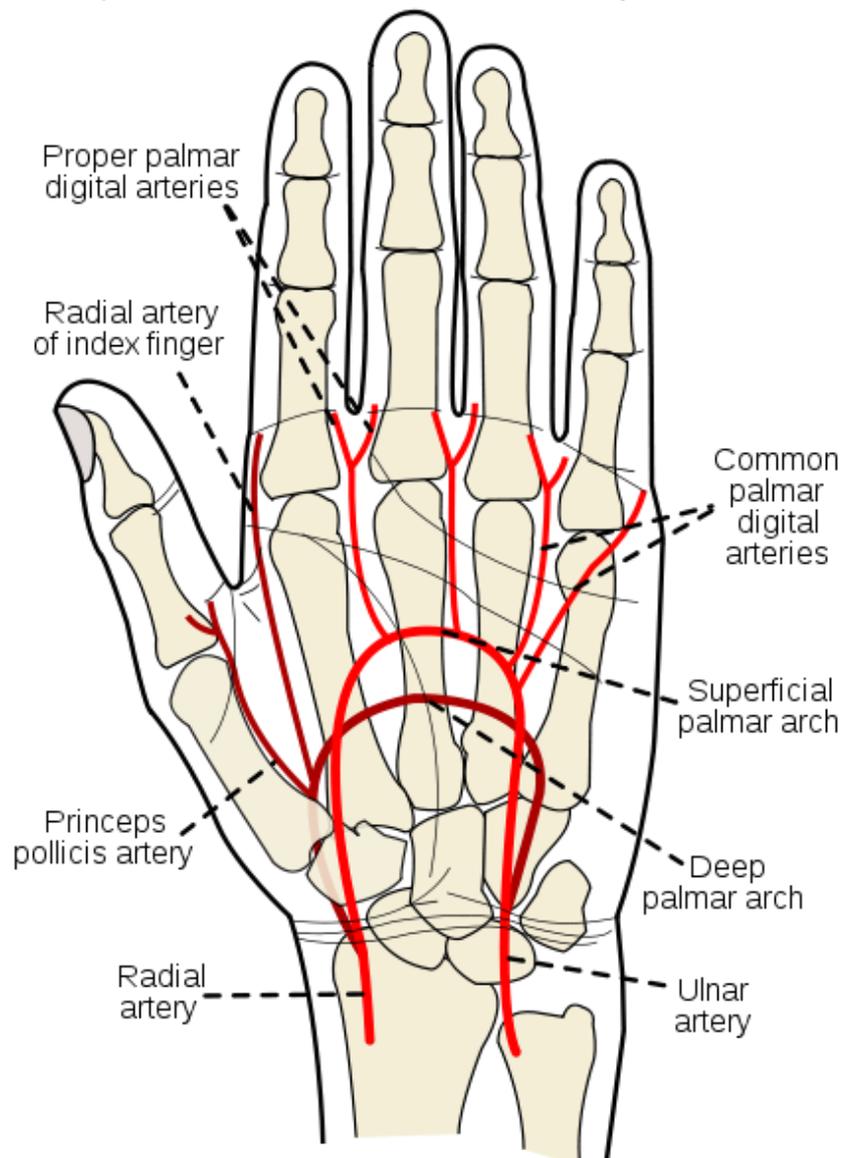
Verbal consent is required to undertake this procedure in patients who have capacity or in their best interest if unable to consent.

Potential Clinical presentations requiring Arterial Blood Gas (ABG) sampling are patients who are attending the oxygen /NIV clinic who require detailed assessment of blood gases to guide the necessary therapies/interventions.

**Target Staff.**

This procedure is to be undertaken by a member of the medical team or a Registered Health Care Professional who has been trained and assessed as competent to do so.

Diagrammatic representation of the Radial Artery in the Left Hand.



**The radial artery** is located in the thumb side of the wrist and is smaller than arteries at other sites. This artery is easily accessible most of the time. It is the first choice and most common

site for ABG collection. It is the only site acceptable for arterial blood gas sampling by non-medical personnel (Williams 1998).

Other sites include the femoral artery, the brachial and axillary artery.

**The advantage** for using this artery is the presence of **collateral circulation**. This means that the area is supplied with blood from more than one artery. Under normal conditions, both the radial and the ulnar arteries supply blood to the hand. If the radial artery were to be damaged during ABG collection the ulnar artery would supply enough blood to prevent the hand becoming ischemic. **The Absence of an Ulnar artery in some individuals prohibits that particular limb being used for ABG sampling. The Ulnar artery also should NOT be used for ABG sampling.**

The **disadvantage** is the radial artery is small in size, requiring a high level of proficiency to sample from. Additionally compounded if the patient is hypotensive and/or hypovolemic.

### **Arterial blood gas sampling for Respiratory Practitioners**

For the purpose of this guideline the radial artery of the non-dominant hand is the artery of choice for nurses performing arterial blood sampling. If neither of the radial arteries can be used for arterial blood sampling the nurse must contact the appropriate medical personnel and request patient review.

### **Arterial sampling must not be performed on limbs with evidence of:**

- Peripheral vascular disease
- Infection
- Skeletal trauma
- Surgical shunt
- Raynaud's or Berger's disease

(Coombs 2001)

### **Allen's Test for Collateral Circulation.**

#### **Epidemiology –**

Inadequate collateral flow in 3% of Hospitalised patients.

#### **Causes of Inadequate Ulnar Circulation-**

Normal anatomic variant.

Hypothenar Hammer Syndrome.

#### **Indications-**

Test Wrist collateral Blood flow.

Arterial puncture for arterial blood gas sampling.

#### **Technique-**

Patient elevates the hand and makes a fist for 20 seconds.

Firm pressure is used to occlude both the radial and ulnar arteries simultaneously.

Patient opens the hand which should blanch (turn white).

Examiner releases only ulnar compression.

**Normal Result will involve the hand flushing pink within 5 to 7 seconds** (ulnar artery present).

**Abnormal result** – Hand remains white until radial pressure released (absence of ulnar artery, risk of serious hand ischemia if radial ABG performed).

## Procedure

### Equipment

- Heparinised blood gas syringe with safety device and size 22G gauge needle
- ChlorPrep SEPP (2% Chlorhexidine Gluconate w/v 70% Isopropyl Alcohol v/v)
- Tape
- Sharps box
- Patient label
- Gloves

This procedure requires two people – the clinician performing the procedure and analysing the sample and an assistant to support the patient's wrist in the appropriate position and to maintain pressure on the puncture site following the procedure. As the procedure is painful, the clinician should consider whether a capillary blood sample would be appropriate, especially where serial monitoring is required. Medical staff may consider using a local anaesthetic prior to arterial blood gas sampling.

ACTION	RATIONALE
1. Explain the procedure to the patient, check their identity, previous difficulties with the procedure.	To gain the patients' consent and co-operation.
2. Check the patients' medication chart for anti-coagulation therapy and any allergies.	To assess the potential for hemorrhage at the sample site.
3. Position the patient in a semi-recumbent position	To decrease the risk of vasovagal response.
4. Assemble necessary equipment for arterial sampling.	To ensure proficiency of procedure.
6. Perform the Allen Test.	To check for the existence of collateral blood supply to the hand from the Ulnar artery.
7 Wash hands, wear PPE, gloves, apron & protective eye wear if required.	To prevent / reduce the risk of cross infection.

8. For radial puncture the patient's wrist is gently extended and supinated with the help of an assistant. A rolled or folded towel may be used to help support the wrist in position	To expose the puncture site and facilitate arterial puncture.
9. Prepare the site by cleaning with an alcohol swab & allow to dry.	To maintain asepsis.
10. Palpate the site for puncture(non-dominant hand)	To find the point of maximum pulsation.
11. Hold the syringe at a 45° angle to the wrist pointing towards the elbow & smoothly insert the needle into the artery.	To ensure successful arterial sampling.
12. Stop needle insertion when the blood flashes into the hub of the needle. Allow the blood pressure to fill the syringe or gently aspirate to the required volume. 1.5-2mls	To prevent needle exiting the other side of the artery.
13. Whilst withdrawing the needle apply digital pressure to the site. Ask assistant to apply pressure for a further <b>2-5 minutes</b> or until bleeding has stopped.	In order for hemostasis to take place. Decrease risk of bruising,
14. Remove the needle immediately from the syringe & place into a sharps box & place a cap on the syringe.	To reduce the risk of needle stick injury, blood spillage & prevent air entry into the syringe.
15. Expel any air bubbles from the syringe.	Air bubbles result I gas equilibration between the air and the arterial blood leading to a decrease in PaCO <sub>2</sub> and increase in PaO <sub>2</sub> (Williams 1998)
16. Manipulate the syringe accordingly.	To mix the heparin & blood to reduce the risk of the sample clotting.
17. Label the syringe & place on ice for transportation to the laboratory / analyzer & analyzed as soon as possible.	To slow the continuing metabolic process in the sample.
18. Note the patients inspired oxygen concentration FIO <sub>2</sub> -usually expressed as a percentage (e.g.24%) and temperature.	To ensure the results are correct for the patient.
19. Dispose of all equipment in accordance with current policy.	To reduce the risk of cross infection & injury to patients & staff.
20. Return to the patient & observe the puncture site for hemorrhage and the hand for adequate circulation.	To ensure patient safety & patency of the circulation following sampling.
21. Document details of the procedure in the patients records and	Good communication and patient safety
22. Act on the results in accordance with relevant protocols/consultant/DR advice <ul style="list-style-type: none"> <li>• NIV policy</li> <li>• Oxygen Policy/LTOT policy</li> </ul>	To ensure that the results are interpreted correctly and the patient receives the appropriate treatment.

All staff that have been nominated by their line manager will require training to undertake this procedure.

### **TRAINING REQUIREMENTS.**

Members of the Respiratory Team will be assessed by senior medical staff such as Registrar/SpR, or Senior Practitioner from the Respiratory team that has been deemed competent for this role.

#### **Training will involve:**

- Practical teaching session.
- A period of observing the procedure (At least 5 observations)
- A period of supervised practice (At least 5 successful samples)
- A formal assessment of competency.
- A statement of competency signed by the assessor and the nurse assessed.

### **REFERENCES**

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**APPROVED**

**Appendix 1**

**PROTOCOL AND ASSESSMENT LOG FOR EAR LOBE CAPILLARY BLOOD GAS SAMPLING  
PERFORMANCE CRITERIA FOR ASSESSMENT OF COMPETENCY FOR EARLOBE CAPILLARY BLOOD GAS SAMPLING**

Performance Criteria	COMPETENT –Mentor Initial and Date									
Identifies need for capillary blood gas sampling according to local Policy										
Explains procedure to patient and obtains consent										
Prepares necessary equipment										
Identifies and prepares appropriate site										
Applies vasodilator cream to ear lobe (arterialisation may take up to 20 mins)										
Stabilises earlobe and stabs fleshy part of lobe to depth of 3mm										
Collects blood sample in correct capillary tube										
Prepares sample for analysis										
Records result accurately and correct patients notes										
Records outcome of care following earlobe capillary sampling										
Clears away appropriately										
Evidence of discussion with patient and /or carer on outcomes and next steps										
Clinical Supervisor name ( <i>please print</i> ): ..... Signature: ..... Date: .....	Candidate name ( <i>please print</i> ): ..... Signature: ..... Date: .....									

When you have completed your competencies please ensure a copy is shown to your line manager and a copy goes into your personnel file

## ASSESSMENT OF COMPETENCY FOR EAR LOBE CAPILLARY BLOOD GAS SAMPLING

**ASSESSMENT SPECIFICATION:** The candidate should be able to demonstrate competence in ear lobe capillary blood gas sampling using the following knowledge evidence and performance criteria

**KNOWLEDGE EVIDENCE:** The candidate should be able to:

- a) Demonstrate skill in the technique of ear lobe capillary blood gas sampling
- b) Discuss the principles of safe practice with regards to ear lobe capillary blood gas sampling
- c) Discuss the role, responsibility and accountability with reference to the Code of Professional Conduct.
- d) Know the normal ranges for blood gas values
- e) Demonstrate a systematic approach to blood gas interpretation
- f) Know some of the common causes of blood gas abnormalities and what to do about them.

*You need a mentor who is competent in ear lobe blood gas sampling who has a completed their competences and passed, working within respiratory services.*

If the candidate still feels they lack competence after supervised practice of at least 10 capillary blood gas samplings, they should seek further training or supervised practice.

- Please attempt to complete competencies within 6-8 weeks of attending course

***I feel competent in undertaking capillary ear lobe sampling technique and analysis of blood gases, within the scope of my clinical practice as part of the patient's treatment plan and have received appropriate training and accept the responsibility within my role***

Candidate (*please print*): ..... Signature: .....

Date: .....

Department: ..... Directorate: ..... Location: .....

***The above named nurse has completed the above training programme and is competent to undertake capillary ear lobe sampling and blood gas analysis as part of the patient's treatment plan.***

Clinical Supervisor (*please print*): ..... Signature: .....

Date: .....

**Comments by Supervisor :**

**Comments by Candidate:**

Appendix 2

## ASSESSMENT OF COMPETENCY I-STAT Analyser

ASSESSMENT SPECIFICATION: The candidate should be able to demonstrate competence in pre-operational inspection, quality control measures, operational use, cleaning and maintenance using the following knowledge evidence and performance criteria.

**KNOWLEDGE EVIDENCE:** The candidate should be able to:

- a) Demonstrate competence in the pre operational inspection and application of the I-stat analyser
- b) Demonstrate and discuss the appropriate quality control measures for the I-STAT analyser
- c) Identify, interpret and operate the I-STAT analyser.
- d) Demonstrate and discuss the cleaning and maintenance of the I-STAT analyser
- e) Discuss the above in relation to the Code of Professional Conduct.

*You need a mentor who has completed this competency and works within respiratory services.*

If the candidate still feels they lack competence after supervised practice, they should seek further training or supervised practice.

- Please attempt to complete competencies within 6-8 weeks of attending course.

Clinical Supervisor (*please print*): ..... Signature: .....

Date: .....

Candidate (*please print*): ..... Signature: .....

Date: .....

Department: ..... Directorate: ..... Location: .....

**Comments by Supervisor:**

**Comments by Candidate:**

Performance criteria	Intended answer/outcome	Evaluation method	Achieved/ Not achieved	Date assessed	Assessed by
<b>Performance criteria 1</b>					
<b>Demonstrate the pre-operational inspection and application of the I-STAT analyser</b>					
Explains the checks prior to use	Explains <ul style="list-style-type: none"> <li>Checks the unit for any sign of damage</li> <li>Check the unit appears clean</li> </ul>	Questioning/Direct observation			
Identifies the main features of the I-STAT	Explains <ul style="list-style-type: none"> <li>Point of care analyser</li> <li>Used for blood gas analysis (can be used for other analysis)</li> <li>Stores 4000 results including QCs</li> <li>Separate printer for hard copy</li> <li>Both arterial and capillary blood can be used</li> </ul>	Questioning			
Identifies the appropriate equipment for use with the I-STAT	Explains <ul style="list-style-type: none"> <li>I-STAT analyser</li> <li>Electronic simulator</li> <li>G3+ cartridge (blood gas)</li> <li>Balanced heparinised syringe or capillary tube</li> <li>Printer</li> <li>QC file, operator manual/user instruction</li> </ul>	Questioning/Direct observation			
<b>Performance Criteria 2</b>					
<b>Demonstrates the ability to undertake the appropriate quality control measures</b>					
Storage of equipment	Explains <ul style="list-style-type: none"> <li>Analyser and printer stored at room temperature away from extremes of temperature</li> <li>G3+ cartridges and aqueous quality control solutions stored between 2-8<sub>0</sub> C</li> <li>Daily record of fridge temperature</li> </ul>	Questioning			

Frequency of QC testing	<p>Explains</p> <ul style="list-style-type: none"> <li>• Daily using the simulator. Analyser will lock if not performed</li> <li>• On delivering of each new batch of cartridges using aqueous solutions</li> <li>• Monthly external QC via Biochemistry Dept. Or POCT Dept.</li> <li>• Hard copy of all QC results kept</li> <li>• Six monthly software update by POCT</li> </ul>	Questioning			
Use of aqueous QC solutions Level 1 and level 3	<p>Explains</p> <ul style="list-style-type: none"> <li>• Store in fridge between 2-8°C</li> <li>• Remove from fridge at least 4 hours before use (minimum of 30 minutes).</li> <li>• Once removed do not return to the fridge and use within 5 days 'if unopened'. Write the new expiry date on the ampoule label.</li> <li>• Check the expiry date before use</li> <li>• Shake vigorously for 10 seconds before use, holding the top and base, then use immediately</li> <li>• Record test results on sheet provided and file away for future reference.</li> <li>• Contact POCT first then Abbott Customer Support (+44 1628 773413) if necessary if the results are outside the expected ranges (depends on the SLA you have with POCT/Biochemistry).</li> </ul>	Questioning/Direct observation			
Use of electronic simulator	<p>Explains</p> <ul style="list-style-type: none"> <li>• Stored at room temperature away from extremes of heat in its protective box with cap in place over the electrodes</li> </ul>	Questioning/Direct observation			

	<ul style="list-style-type: none"> <li>• Never try to remove the simulator if 'cartridge locked' is displayed on the screen</li> <li>• Record test results on the sheet provided and file away for future reference</li> <li>• If test fails, try again ensuring electrodes are clean if it still fails contact POCT/Abbott Customer Support</li> </ul>				
Use of G3 cartridges	<p>Explains</p> <ul style="list-style-type: none"> <li>• Store in fridge between 2-8°C</li> <li>• Remove single cartridge 5 minutes before use (whole box 1 hour) and once removed not to return to fridge. Now ready to use</li> <li>• Once removed from the fridge the cartridge must be used within 2 months. Write expiry date on the cartridge wrapper.</li> <li>• Check expiry date.</li> <li>• Remove the cartridge carefully from the wrapper once ready to use. Hold it on its sides only. Taking care not to touch the contact pads and the calibration pack in the centre of the cartridge.</li> <li>• Insert only the required amount of blood into the well, as indicated on the cartridge. Fold the flap over the well and snap it in place.</li> <li>• Inset the cartridge carefully into the analyser port, holding on its sides.</li> <li>• Never try to remove the cartridge with the 'cartridge locked' displayed on the screen. Single use and disposed of as clinical waste.</li> </ul>	Questioning/Direct observation			
<b>Performance criteria 3</b>					

<b>Identifies, interprets and operates I-STAT analyser</b>					
On/off switch	Explains <ul style="list-style-type: none"> <li>The button is pressed to switch the analyser on or off.</li> <li>The analyser will automatically switch on when a cartridge is inserted and switches itself off after a period of being idle.</li> </ul>	Questioning/Direct observation			
Menu button	Explains <ul style="list-style-type: none"> <li>Allows access to the various functions by selecting from the menu and choosing the desired function.</li> </ul>	Questioning/Direct observation			
Operator ID	Explains <ul style="list-style-type: none"> <li>Unique number given to each operator on the named operator list.</li> </ul>	Questioning/Direct observation			
Simulator ID	Explains <ul style="list-style-type: none"> <li>Found on the back of the electronic simulator and required to input when doing the daily simulator test.</li> <li>Alinity barcode is on the front of the simulator.</li> </ul>	Questioning/Direct observation			
Lot numbers	Explains <ul style="list-style-type: none"> <li>Found on both cartridges and aqueous quality control solutions</li> <li>Inputted when requested by either scanning or barcode manually.</li> </ul>	Questioning/Direct observation			
Patient identification	Explains <ul style="list-style-type: none"> <li>NHS number/ hospital given to all patients in hospital</li> <li>Where no hospital number available, use date of birth, e.g. 5<sup>th</sup> October 1080 = 05101980</li> <li>Where no hospital number available also enter the patient initials</li> <li>Check sample from correct patient</li> </ul>	Questioning/Direct observation			

	<ul style="list-style-type: none"> <li>Writes patient name on the printed hard copy</li> </ul>				
Display and printing results	<p>Explains</p> <ul style="list-style-type: none"> <li>Results are displayed on screen and can be printed off</li> <li>Align printer with analyser to print off results</li> <li>Results are stored and can be recalled for future reference and printed if required.</li> </ul>	Questioning/Direct observation			
Cartridge lock message	<p>Explains</p> <ul style="list-style-type: none"> <li>Under no circumstances should the simulator or cartridge be removed when this message is displayed on screen.</li> </ul>	Questioning/Direct observation			
<b>Performance criteria 4</b>					
<b>Cleaning and maintenance</b>					
Cleaning	<p>Explains</p> <ul style="list-style-type: none"> <li>Clean the analyser using a multi-surface mild detergent wipe</li> <li>Dry immediately</li> <li>Do not let moisture into the analyser.</li> <li>For I-stat Alinity) Avoid forcing liquid into cartridge port, 10 pin connector.</li> </ul>	Questioning/Direct observation			
Changing the batteries	<p>Explains</p> <ul style="list-style-type: none"> <li>Change when low battery is displayed</li> <li>Use two 9V lithium batteries.</li> <li>I -stat Alinity requires charging on base unit so no battery change required. Patient testing is prevented on I-stat Alinity if battery under 5%.</li> <li>if battery failure contact POCT</li> </ul>	Questioning/Direct observation			
QC results	<ul style="list-style-type: none"> <li>QC results sheets have to be kept for the life of the analyser</li> <li>WEQAS reports kept for 2 years</li> <li>POCT keep reports electronically</li> </ul>				
Clinical Supervisor name ( <i>please print</i> ):			Candidate name ( <i>please print</i> ):		

..... Signature: ..... Date: .....	..... Signature: ..... Date: .....
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When you have completed your competencies please ensure a copy is shown to your line manager and a copy goes into your personnel file

*Please note that the majority of the home oxygen nurses use the I-STAT machine but in secondary care and on respiratory wards different machines maybe in use like the Roche Cobas B123. Specific training will be required on these machines from POCT co-ordinators.*

**Appendix 2**

**ASSESSMENT CRITERIA /ARTERIAL BLOOD GAS SAMPLING**

NAME OF PRACTITIONER..... DATE.....

Performance Criteria	PASS	REFER	COMMENTS –Mentor Initial and Date
Does the nurse demonstrate knowledge of the radial artery anatomy & surrounding structures?			
Is the nurse able to identify the patient groups for whom arterial blood gas samples may influence management?			
Has the nurse an understanding of the medico-legal aspects pertaining to this procedure?			
Did the nurse adequately explain the procedure to the patient to gain their consent?			
Was the nurse able to perform the Allen test accurately?			
Was the nurse able to obtain a sample in the manner instructed?			
Did the nurse dispose of the equipment in the correct manner?			
Did the nurse return to check the puncture site?			

Is the nurse aware of the possible complications associated with the procedure?			
Has the nurse documented the procedure undertaken, including the puncture site in the patient's notes?			
<b>ASSESSOR NAME:</b> <b>SIGNATURE:</b>			

When you have completed your competencies please ensure a copy is shown to your line manager and a copy goes into your personnel file

## TRAINING AND ASSESSMENT LOG /ARTERIAL BLOOD GAS SAMPLING

Name of Practitioner.....

Designation.....

### OBSERVATIONAL RECORD.

DATE	SIGNATURE OF TRAINER	SIGNATURE OF CANDIDATE.
1.		
2.		
3.		
4.		
5.		

### PRACTICAL DEMONSTRATION.

DATE	SIGNATURE OF TRAINER	SIGNATURE OF CANDIDATE.
1.		
2.		
3.		
4.		

5.		
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**FINAL ASSESSMENT RESULT.**

ASSESSED BY	
ASSESSOR SIGNATURE	
DESIGNATION.	
<b>PASS</b>	<b>REFER</b>

When you have completed your competencies please ensure a copy is shown to your line manager and a copy goes into your personnel file