Arterial Blood Sampling:
Procedure for obtaining an arterial blood gas - Adult

Quick Links to:

Site Applicability

All VCH & PHC acute care sites

Practice Level

RN: Advanced Skill – required additional education and training prior to completing this skill independently
RT: Basic skill

Need to Know

This guideline describes how to withdraw an arterial blood gas sample (ABG) from an arterial line using a closed (i.e. venous arterial blood management protection system (VAMP) or open (stopcock) arterial blood sampling system. The closed arterial blood sampling system (i.e. VAMP) reduces the risk of infection (O'Grady et al., 2011) and helps to conserve blood. The open system (stopcock) can increase risk of infection (INS, 2011) but there may be settings or applications where a stopcock system is still required for sampling. If using a stopcock, it is recommended to attach sterile caps to all access ports and clean these ports prior to sampling to reduce the risk of infection (INS, 2011; O'Grady et al., 2011).

Arterial blood gas (ABG):
The sampling of the blood levels of oxygen and carbon dioxide within the arteries, as opposed to the levels of oxygen and carbon dioxide in venous blood. Typically the acidity, or pH, of the blood is measured simultaneously with the gas levels in ABG sampling.

Types of Syringes:

- A **vented** syringe (e.g. SafePICO Self-fill™) automatically fills by arterial pressure and does not require pulling back on the syringe plunger to obtain a sample.
- A **non-vented** syringe (e.g. SafePICO Aspirator™) requires pulling back on to the syringe plunger to obtain a sample. Non-vented ABG syringes can be used for obtaining arterial sample from arterial lines or mixed venous samples from low pressure, venous access lines such as central venous catheter (CVP, femoral), pulmonary artery catheters and jugular bulbs.

Procedure

Equipment and Supplies

- Arterial blood gas syringe (vented or non-vented as per site specific practice – *see below*)
- Alcohol Swab
- Personal protective equipment (PPE) - gloves, goggles, gown
- Closed arterial blood sampling system adaptor
- Dead-ender –(stopcock system)
- 10 ml Luer-lok tip syringe-(stopcock system)

Site Specific Practices

- **PHC:** use non-vented syringes (e.g. SafePICO Aspirator™) for arterial blood sampling.
- **VCH:** use vented syringes (e.g. SafePICO Self-fill™) for arterial blood gas sampling.

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A. Closed Arterial Blood Sampling System

The closed arterial blood sampling system includes a 5 mL reservoir that holds the discard blood during sampling. This system is designed to conserve blood by returning the discard blood back into the system after sampling. See VAMP system resources.

Procedure

1. Obtain necessary equipment for ABG sampling using closed arterial blood sampling system
2. Perform hand hygiene and follow hospital **VCH:** infection control guidelines **PHC:** infection control guidelines **to ensure the use of correct personal protective equipment (PPE)**
3. Silence or standby monitor alarm.
4. Pre-set **vented ABG syringe** to a minimum of 1 mL. If using **non-vented syringe**, depress plunger to remove excess air from the syringe.

   NOTE: Image of vented syringe

5. Place adaptor onto ABG syringe. NOTE: there are specific required steps if using PICO ABG syringes (vented and non-vented)

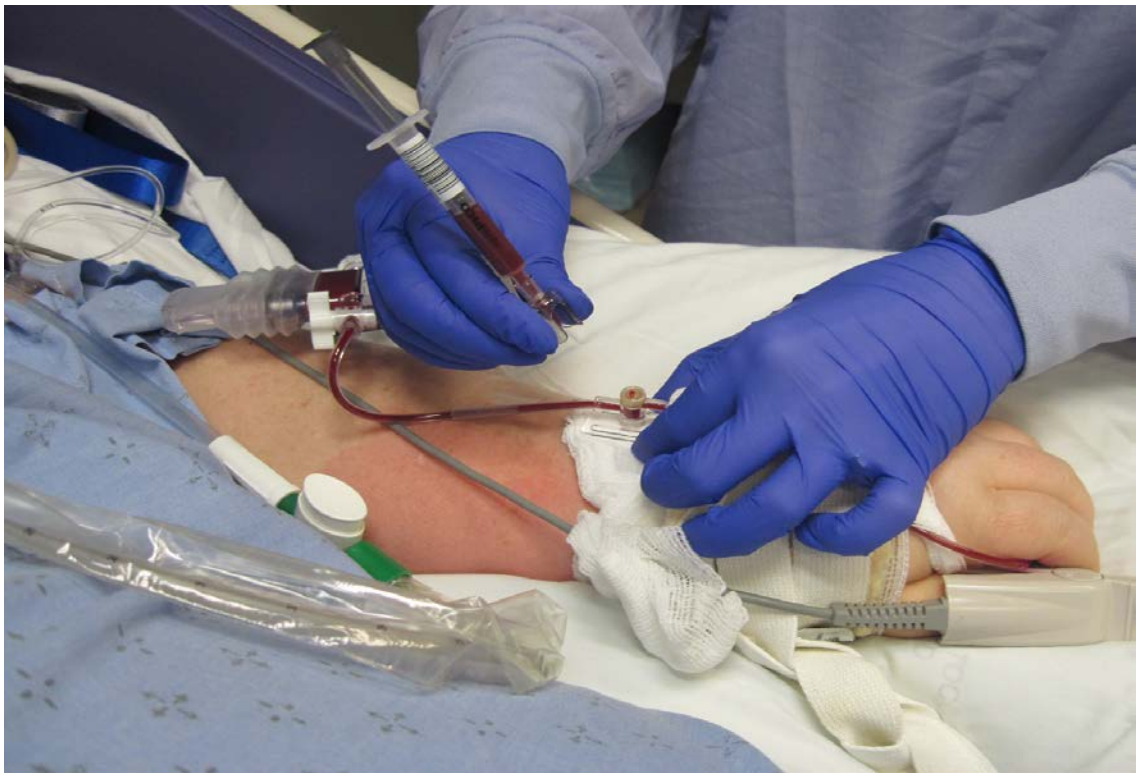
6. Cleanse the blood sampling port on the arterial line with an alcohol swab and allow solution to dry for 15 seconds. **NOTE:** Please ensure blood sampling port is not contaminated prior to sampling.

7. Slowly and gently pull back on the blood withdrawal reservoir plunger until it fills to full capacity.
   NOTE: the blood in the reservoir must be re-infused within 2 minutes of withdrawal.

8. Close the shut off valve (stopcock) by turning it perpendicular to the tubing.

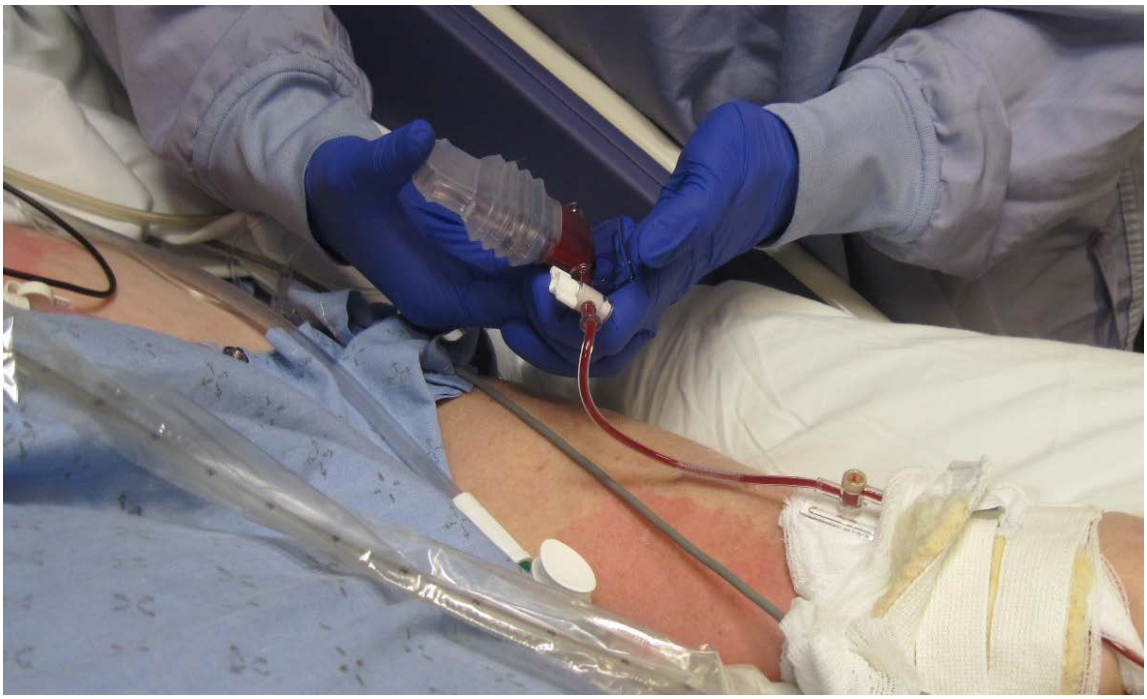
9. Connect adaptor and syringe to blood sampling port. If using **vented syringe** allow syringe to fill to obtain ABG sample while holding the adaptor. If using **non-vented syringe**, withdraw sample by slowly pulling back on plunger. The sample should be at least 1 mL in volume.

10. After the sample is obtained, hold the base of the arterial line blood sampling port and remove the adaptor together with the syringe attached from the blood sampling port by pulling it straight out.



11. Remove syringe from adaptor.
12. Open the stopcock by turning it parallel to the tubing.

13. Slowly and smoothly re-infuse the discard volume using the blood withdrawal reservoir plunger.
    NOTE: the reservoir blood must be re-infused within 2 minutes of withdrawal.



14. Depress blood withdrawal reservoir plunger until fully depressed and it ‘clicks’ into place.

15. Flush the system using the fast-flush device.

16. Cleanse the blood sampling port of the arterial line with an alcohol swab and allow drying for 15 sec.

17. Ensure alarms are functioning and verify arterial waveform.
18. Follow product specific instructions on sample mixing for ABG syringes to remove air bubbles and apply safety cap. See PICO ABG syringes.

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B. Open (Stopcock) system

The open system uses a stopcock for obtaining an ABG sample from an arterial line. It is recommended when using this system to attach sterile cap to all ports when not in use and cleanse access ports prior to sampling to reduce the risk of infection (INS, 2011).

Procedure

1. Obtain necessary equipment for ABG sampling using a stopcock
2. Perform hand hygiene and follow hospital VCH: infection control guidelines , PHC: infection control guidelines **to ensure the use of correct personal protective equipment (PPE)**
3. Silence or standby monitor alarm.
4. If using **vented ABG syringe** pre-set to minimum of 1 mL. If using **non-vented syringe** depress plunger to remove excess air from syringe.
5. Locate stopcock nearest to the arterial insertion site.
6. Remove protective dead ender with alcohol swab. Discard dead ender. Cleanse access port with alcohol swab.
7. Attach 10 mL Luer-lok tip syringe.
8. Turn stopcock off to transducer and open to the patient.
9. Withdraw up to 5 mL of fluid to clear the catheter and tubing of flush solution.
10. Turn stopcock to halfway position to close all ports.
11. Attach blood gas syringe. (Follow specific instructions for PICO syringes – see Appendix A or B)
12. Open stopcock (turn away from site) and allow to fill if using **vented syringe**, obtain the sample (1mL minimum sample size). If using **non-vented syringe**, withdraw sample by slowly pulling back on syringe plunger, obtain the sample (minimum 1 mL sample size).
13. Turn stopcock off to patient. Remove ABG syringe (Follow specific instructions for PICO syringes).
14. Cap the ABG syringe with cap (Follow specific instructions for PICO syringe)
15. Flush port.
16. Turn stopcock off to port.
17. Flush catheter until clear to prevent clotting.
18. Cleanse port with alcohol and apply new dead ender.
19. Ensure return of arterial waveform and alarms
20. Remove PPE and wash hands.

C. After sample is obtained

1. Discard used supplies, remove PPE and perform hand hygiene
2. Ensure alarms are on and the waveform returns
3. Label the specimen and complete appropriate lab requisition as per clinical area (in PCIS or hardcopy)
4. Send the specimen for analysis
5. Document the procedure in the patient's record.

Related Documents

- Appendix A: SafePICO Self-fill Syringe (vented) – syringe instructions
- Appendix B: SafePICO Aspirator Syringe (non-vented) – syringe instructions
- Appendix C: VAMP system
- Product in-service video: VAMP System
- Infection control guideline: PHC infection control guidelines
  VCH infection control guidelines

References

Churbock, C (July 2011). Arterial catheter: blood sampling. Mosby Nursing Skills online 2011.

Infusion Nurses Society (INS) (2011). Infusion Nursing: Standards of Practice. Infusion Equipment, Standard 26: Add on devices, p. S 31.

Medicinet (2011). Definition of Arterial blood gas. Retrieved from April 24, 2012 from http://www.medterms.com/script/main/art.asp?articlekey=8516.

O'Grady, N et al. (2011). Center of Disease Control (USA): Guidelines for the prevention of intravascular catheter related infections, p. 18, 54.

Wilkins, R. Stoller, J. & Scanlan, C. (2003). Egan's Fundamentals of Respiratory Care (8th ed). Mosby, Inc.

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Appendix A:

SafePICO Self-Fill (vented) Instructions - Product#: 956-610

Sampling

If using the VAMP system:

Firmly place and twist a VAMP adaptor onto the syringe slip luer tip (push down and make a ¼ turn).

Preset the syringe to a minimum of 1mL.

Take the sample while holding the VAMP adaptor (do not hold the syringe while taking the sample).

While holding the VAMP adaptor, remove the adaptor with the syringe still attached from the VAMP line.

Remove the VAMP adaptor from the syringe with a ¼ turn in the opposite direction.

If using a stop cock system:

Preset the syringe to a minimum of 1mL.

Firmly place and twist the syringe slip luer tip into the stop cock (push in and make a ¼ turn).

Open the stop cock and take the sample.

Close the stop cock and remove the syringe from the stop cock with a ¼ turn in the opposite direction.

Sample mixing and removal of air bubbles

If you need to run a blood glucose test, then do so before placing the safeTIPCAP on the syringe slip luer tip and venting the syringe. (You may place the safeTIPCAP on the syringe slip luer tip and transport the sample a short distance to run your blood glucose test, BUT do not vent the syringe until you have taken your blood glucose test sample).

Hold onto the syringe barrel, so that it is vertical at a 90 degree angle to the ground.

Firmly place and twist the safeTIPCAP onto the syringe slip luer tip (push down and make a ¼ turn).

Flick any air bubbles that you can see to the top of the syringe.

Press the plunger to expel air through the vented safeTIPCAP.

Completely fill the clear circle at the bottom of the safeTIPCAP with blood until you feel a change in the pressure. This will seal the safeTIPCAP. Do not push the plunger any further.

Mix the sample by inverting the syringe several times.

Appendix B:

SafePICO Aspirator (non-vented) instructions – Product #: 956-622

Sampling

If using the VAMP system:

Push the syringe plunger into the syringe as far as possible.

Firmly place and twist the syringe luer lip onto the VAMP adaptor **(push down and make a ¼ turn).**

Take the sample while holding the VAMP adaptor **(do not hold the syringe while taking the sample).**

Draw your sample (a minimum of 1 ml).Pull the syringe plunger back slowly to avoid getting air into the sample).

While holding the VAMP adaptor, remove the adaptor with the syringe **still attached** from the VAMP line

Remove the syringe from the VAMP adaptor with a ¼ turn in the opposite direction.

If using a stop cock system:

Push the syringe plunger into the syringe as far as possible.

Firmly place and twist the syringe luer lip onto the stop cock (push down and make a ¼ turn).

Open the stop cock.

Draw your sample (a minimum of 1 ml). (Pull the syringe plunger back slowly to avoid getting air into the sample).

Close the stop cock.

Remove the syringe from the stop cock with a ¼ turn in the opposite direction.

Sampling mixing and removal of air bubbles

If you need to run a glucose/chemistry strip, then do so before placing the safeTIPCAP on the syringe luer lip and venting the sampler. (You may place the safeTIPCAP on the syringe luer lip and transport the sample a short distance to run your glucose/chemistry strip, BUT do not vent and seal the sampler until you have taken your glucose/chemistry strip sample).

Hold onto the syringe barrel, so that it is vertical at a 90 degree angle to the ground.

Firmly place and twist the safeTIPCAP on the syringe luer tip (push down and make a ¼ turn).

Flick any air bubbles that you can see to the top of the syringe.

Press the plunger to expel air through the vented tip cap.

Completely **fill** the clear circle at the bottom of the safeTIPCAP with blood until you feel a change in the pressure. This will seal the safeTIPCAP. **Do not push the plunger any further.**
Mix the sample by inverting the sampler several times.

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Appendix C:

VAMP System Inservice Bulletin

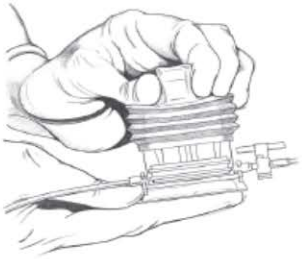
Venous Arterial blood Management Protection system

Safe and Accurate Closed Blood Sampling System

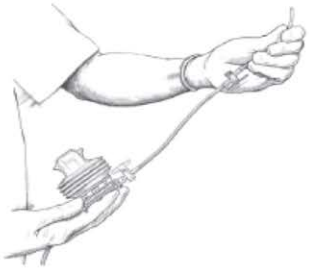
Featuring the Edwards TruWave Disposable Pressure Transducer

PRIMING

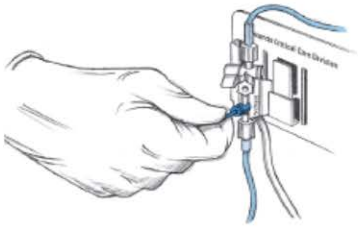
1 Squeeze and hold flexures to slightly raise plunger to facilitate flow of priming solution.



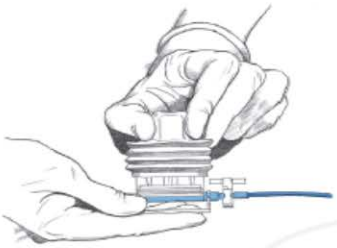
2 With the shut-off valve in the open position (parallel to the tubing), hold sampling site above the Edwards VAMP reservoir at 45° angle.



3 Provide flow by pulling Snap-Tab of the Edwards TruWave disposable pressure transducer.

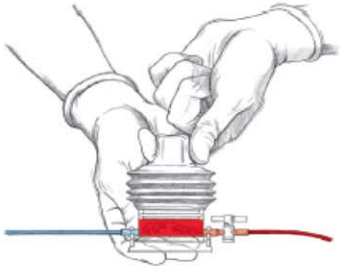


4 Slowly deliver priming solution to remove air. Close plunger and connect to your patient's catheter.

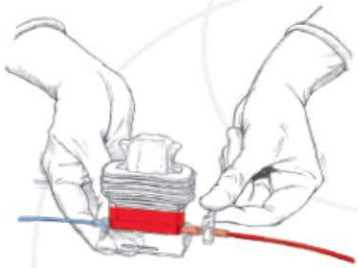


DRAWING THE CLEARING VOLUME

5 Firmly squeeze the flexures and slowly draw the reservoir open over 3-5 seconds.



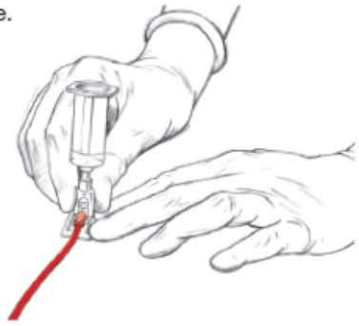
6 Close shut-off valve by turning handle perpendicular to tubing.



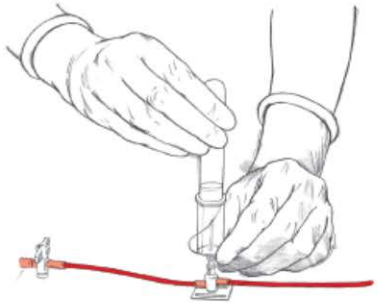
Edwards

DRAWING BLOOD SAMPLES FROM THE VAMP NEEDLELESS SAMPLING SITE

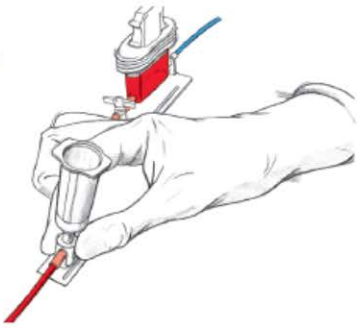
7 Swab sample site. Push cannula with syringe or Direct-Draw unit onto sample site.



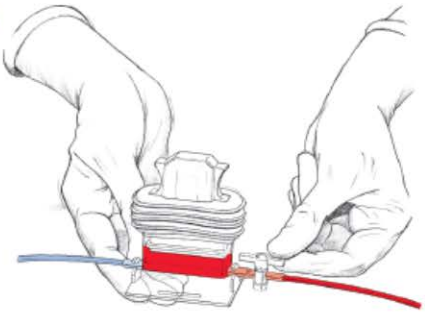
8 Put vacuum tube** into Direct-Draw unit. (Repeat to complete blood study requirements.)



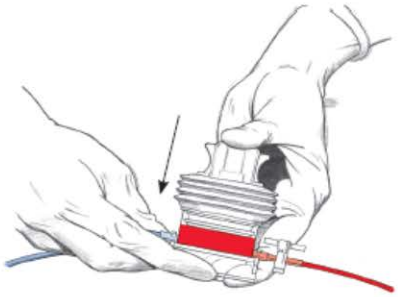
9 After the last sample has been drawn, grasp the VAMP Direct-Draw unit by the cannula and pull straight out.



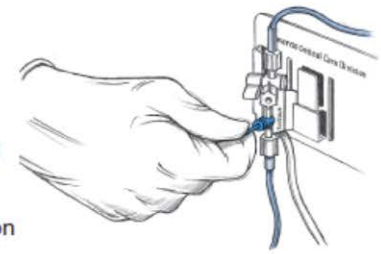
10 Open shut-off valve by turning handle parallel to tubing.



11 Smoothly and evenly over 3-5 seconds, push down on the plunger until the flexures lock in place in the fully closed position and all fluid have been reinfused into the line.



12 Flush the VAMP system clear by pulling the Snap-Tab on the TruWave transducer and swab the sampling site ensuring removal of any excess blood left on the sampling port.



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**There is no indication or contraindication for the use of vacuum tubes on arterial lines.

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