Frequent Blood Sample Acquisition from a Peripheral Vein with a Closed Loop System

Aaron H. Mendelson, B.A., Jeffrey Joseph, D.O., Brian Hipsher Ph.D., Ali Alagoz M.D., Jung-Won Park M.D., Uma Gajula MD, Jessica Piercy, B.S.
Department of Anesthesiology
Jefferson Medical College of Thomas Jefferson University

Introduction

The Venous Arterial Blood Management Protection Plus (VAMP Plus, Edwards Lifesciences Irvine, CA), is a closed-loop blood sampling system. The device has FDA approved labeling for attachment to central arterial and central venous catheters. It has yet to receive FDA approval labeling for attachment to peripherally inserted central venous catheters.

**Clinical Significance of VAMP PLUS**
- Minimizes blood loss when sampling from an arterial catheter.
- Minimizes blood loss when sampling from a venous catheter.
- Decreases the risk of bacterial contamination and infection.

**What is a Closed Loop Sampling System?**
- Blood sample aspirated into single tubing and reservoir.
- Clean sample obtained from needless sampling port.
- Blood sample returned to bloodstream, without blood loss.
- System cleaned with flush solution.

**Clinical Significance of VAMP PLUS**
- Minimizes blood loss when sampling from an arterial catheter.
- Minimizes blood loss when sampling from a venous catheter.

**Clinical Significance of VAMP PLUS**
- Minimizes blood loss when sampling from an arterial catheter.
- Minimizes blood loss when sampling from a venous catheter.

**Free Hemoglobin in VAMP and Single Stopcock Samples**

**Methods**

**Effectiveness of Blood Withdrawal**
- A 20 gauge intravenous (IV) catheter was inserted into a forearm vein of each upper extremity. One IV catheter was attached to the VAMP Plus system (Figure 4). The other IV catheter was attached to a single stopcock and tubing (Figure 2).
- Blood was drawn into a 5ml syringe from the VAMP Plus and single stopcock systems.
- Each sample was measured in 1ml aliquots using a YSI 2300 STAT Plus (YSI, Inc., Yellow Springs, OH).

**System Failures Protocol**
- If non-blood could not be sampled after 60 seconds, the withdrawal was deemed an initial failure.
- The following troubleshooting steps were used to attempt to obtain a sample:
  1. Flush the catheter gently with 2 ml of 0.9% saline solution (NSS).
  2. Flush the catheter vigorously with 5 ml of NSS.
  3. Inflating upper arm blood pressure cuff (BP cuff) in 10-30 mm Hg for 60 seconds.
  4. Place manual traction on the IV catheter.
  5. Pull catheter outward 1-2 mm and apply new tape.

**Conclusions**
- Too early to determine if VAMP has a lower failure rate than single stopcock.
- The VAMP Plus had an initial failure rate of 1.96% and a total failure rate of 0.5%.
- The single stopcock had an initial failure rate of 1.1% and total failure rate of 0.5%.
- The BP cuff failed to improve withdrawals. The only failures observed during this phase of the study were with a deflated BP cuff.
- The mean difference in glucose readings of the VAMP and the single stopcock samples were similar as long as VAMP samples remained free of clot.

**Future Considerations**
- Simple test withdrawn over a 3 hour period at frequent intervals.
- In clinical practice, sampling would occur less frequently over a longer period of time.
- Future studies are required to study failure rates of the VAMP Plus over a longer period of time.

**References**
2. Peruzzi Wt, Noskin GA.  Microbial contamination of blood conservation devices during routine use in the critical care setting: results of a prospective, randomized trial.