

Blood Sampling from Catheters

Question:

We are being asked to use vascular access devices to obtain blood samples more frequently than ever before. We use a method that requires drawing 10 ml of blood to discard before drawing the sample for the lab. I am concerned about wasting so much blood especially in patients that need blood drawn many times during the day. Is there another way to draw blood from a catheter without discarding the first 10 ml?

Answer:

Several changes in practice are converging to warrant your concern for excessive blood loss including sicker patients needing accurate and frequent lab values, greater numbers of central venous catheters, and a growing concern about iatrogenic blood loss and the subsequent anemia that may result.

Blood loss has always been a concern in infants, but now there is attention to blood loss in adults as well. In a 7 kg infant, 25 ml of blood loss represents 5% of the total circulating blood volume of 500 ml. In a healthy 70 kg adult, 25 ml blood loss is less than 0.6 % of the 4150 ml of total circulating blood. 1 There could be numerous reasons for adult patients having a reduction of this total blood volume due to disease or injury.

The presence of a central venous catheter makes it relatively easy to use it for obtaining frequent blood samples, eliminating the need to perform repeated venipunctures. However the use of a central venous catheter requires that some method be used to remove the contents from the lumen such as drugs recently infused, saline or heparinized saline. Another issue is the risk of infection from increased hub manipulation, although the issue of iatrogenic blood loss is becoming a major concern. 2, 3

In a large, multi-facility study of intensive care units in western Europe, the number of blood samples and the total volume of blood taken in a 24 hour period in critical care patients was positively correlated to the Sequential Organ Failure Assessment (SOFA) score. In 1136 patients studied, 45.9% of patients had 5 or more blood samples drawn in a 24-hour period. The mean number of draws per patient was 4.6 with 41 ml as the average volume of blood withdrawn. This represents about 1% of total circulating blood volume daily from a healthy adult. The study did not provide specifics about whether these blood samples were obtained from a central venous catheter or from a direct venipuncture. However, 146 hospitals were included and it could be assumed that a variety of methods were used. Taking this amount of blood over multiple days results in a significant blood loss, contributing to anemia and the need for blood transfusions. 4

Methods suggested to decrease the discard volume include the use of point-of-care testing, microchemistry techniques using smaller quantities of blood for testing, and use of transducer systems that do not require a discard volume. In many healthcare settings

these techniques may not be possible requiring that we reconsider our process for withdrawing the sample from the catheter.

There are 3 methods- discard, reinfusion, and mixing- described in the literature for withdrawing blood samples from central venous catheters, although there are very few scientific studies to support their use.⁵ The discard method is the most common method used but there are many unanswered questions such as the most appropriate amount of discard volume. The reinfusion method calls for aspirating the discard volume into a syringe that is set aside while the samples are drawn. The discard volume is then reinfused, however this raises serious concerns about contamination and reinfusion of clots.⁶

The mixing method is not commonly used but could be the answer to the issue of iatrogenic anemia since it eliminates the need for discarding any blood. This method involves withdrawing 6 ml of blood into a syringe, then reinjecting into the catheter. This process is repeated 3 or 4 times, then the empty syringe is disconnected and a new syringe attached to obtain the sample to be sent to the lab. A study comparing the discard method with the mixing method measured the hemoglobin, hematocrit and creatinine values. Both methods produced lab values that were essentially equal.⁷ While additional studies are needed, this method appears to be one answer to the issue of iatrogenic blood loss in many patients.

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