Needle Know-How

Skin Puncture vs. Venipuncture

One decision specimen collection personnel make with every patient is whether to perform a skin puncture or a venipuncture. Most of the time, a venipuncture is mandated by the volume of blood required to complete the battery of tests ordered. Other times, it's not as cut and dried. For example, a physician orders a CBC and bilirubin on a newborn. Some would argue that blood from a venipuncture is the "gold standard" and that blood from a skin puncture is subject to more preanalytical errors and less likely to be accurate. Myth or reality? Let's look at the pros and cons of each method of specimen collection.

The benefits and drawbacks of drawing blood by venipuncture are listed in Table I.

Table I.
Pros and Cons of Venipuncture

Pros	Cons
direct access to the circulatory system	increased risk of accidental needlestick
the ability to draw larger volumes of blood	increased potential for patient injury
potentially less traumatic to the patient	potential for hemoconcentration
faster than obtaining capillary blood	potential for hematoma formation
less likely to be contaminated by tissue fluids	requires patient stability
less likely to be hemolyzed	iatrogenic anemia more likely
requires less time to complete	unable to detect nerve damage in infants

One of the disputable concepts, especially in the minds of physicians, is that blood obtained by venipuncture renders a more accurate representation of the patient's circulating blood that that obtained by skin puncture. This conception may be based on the presumption that all venipunctures are performed correctly and cleanly and all capillary punctures are contaminated by hemolysis and tissue fluids. Although the latter concern may be justified, when properly performed, skin punctures can render a sample just as representative of the circulation as that obtained by venipuncture. (Note: skin punctures or incisions performed on edematous sites or from dehydrated patients may not yield representative results regardless of technique.)

Skin Punctures also have their pros and cons. (see Table II.)

Table II.
Pros and Cons of Skin Puncture

Pros	Cons
patient stability less critical	hemolysis more likely
requires less precision	specimen clotting more likely
minimizes iatrogenic anemia	yields smaller volumes of blood
decreased risk of accidental needlestick	more painful to the patient
patient injury less likely	potential for tissue fluid contamination
	takes longer to complete

To assure the best sample is obtained, collectors who perform skin punctures should prewarm the site for 3-5 minutes with a warm compress not

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to exceed 42 degrees Celsius. Massage can also be used in conjunction with prewarming. When properly prewarmed, the flow of blood through the tissue has been reported to increase seven-fold.[1] Although some argue that prewarming takes too long to perform, advocates of prewarming argue that time spent increasing the circulation of an infant's heel can equal the time spent milking blood from a site that hasn't been prewarmed; the difference being only that the blood obtained from the prewarmed site is more likely to yield accurate results, less likely to be rejected because of hemolysis or clot formation and of an overall higher quality than that obtained without prewarming in the same amount of time.

Besides prewarming skin puncture sites, wiping off the first drop of blood makes the specimen even more comparable to venous blood. Since the trauma of the puncture or incision inevitably releases tissue fluids into the lanced tissue, wiping away the first drop is seen as a means to minimize if not eliminate the potential for tissue fluid to alter results. Except for a few bedside testing devices that require first-drop testing, collectors should wipe away the first drop that emerges from a skin puncture or incision with a clean gauze pad before collecting the specimen that will be sent to the lab for testing.

By prewarming the site and wiping away the first drop of blood, capillary blood can closely approximate venous blood in specimen quality and dispel the myth that venous blood is the only specimen that can accurately represent the patient's physiology. But keep in mind, even when capillary specimens are collected cleanly with minimal trauma, they remain a mixture of blood from capillaries, venules, arterioles with some interstitial and intracellular material, the proportion of which is dependent upon technique. Because of this composition, capillary specimens show lower concentrations of potassium, total protein and calcium and higher concentrations of glucose.[1]

But when venipunctures are performed haphazardly and without regard for the established standards, a capillary specimen can even yield more accurate results as long as other well-established considerations remain intact, considerations such as properly mixing specimens containing additives during or immediately following collection. Since capillary specimens flow through ruptured capillary beds, platelets are more likely to clump together and precipitate clot formation in the collection tube than during venipuncture. Gently tapping or flicking collection tubes as they are being filled may inhibit clotting during the collection process and prevent specimen rejection. However, collectors must be adequately protected against exposure when mixing blood during collection if the collection device being used is open-ended (e.g., devices with scoop-like openings) and require filling without a cap. For optimum safety, specimens should be collected in closed systems (e.g., devices with built-in capillary tubes or funnels that pass through the cap).

Careful attention to the increased potential for capillary specimens to clot during collection can not only prevent specimen rejection, but remove a significant downside to collecting specimens by skin puncture.
