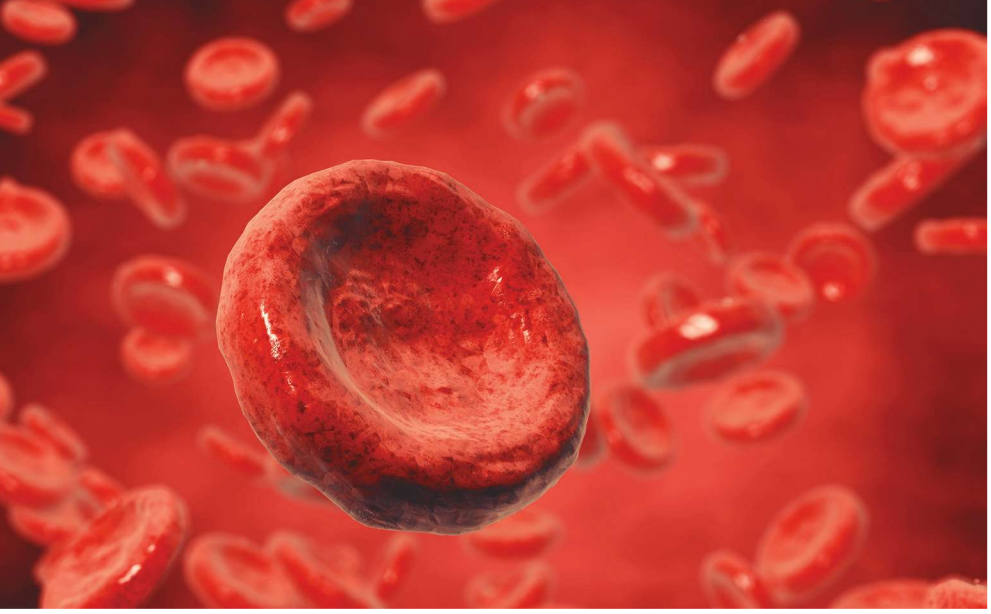

Two New Evidence-Based Steps for CLABSI Reduction

By Terese Ireland, RN, BSN, VA-BC; Robert Wolk, PharmD, MS, BS; and Eric Bergstrom, PharmD

The Centers for Disease Control and Prevention (CDC)'s Checklist for Prevention of Central Line Associated Bloodstream Infections (CLABSI) lists as its No. 1 task for clinicians: Perform daily audits as to whether each central line is still needed.[1] However, if the daily audit is not done with a clear and current knowledge of what constitutes a valid indication for central venous access, and if that knowledge is not acted on promptly, what's the point?

Here is a classic situation:

Infection preventionist (IP): "Doctor, this triple lumen CVC has been in for six days now. The danger of CLABSI is increasing. May I ask if it is still needed?"

MD: "Yes, it is."

IP: "May I ask what the current indication is?"

MD: (Pause) "I need access for blood draws and the patient needs four more day of intravenous vancomycin."

IP: "Very well, we will continue to maintain the line."

There is a lot right and a lot wrong with this brief conversation. The IP is right to ask if the central venous catheter (CVC) is still needed and is very right to ask for "the current indication." Remember, indications for a CVC can and do change daily. The physician is wrong concerning the indications: first, intravenous access for blood draws is generally not an indication for a central line;[2] second, four days of intravenous vancomycin is generally NOT an indication for a central line, notwithstanding the Infusion Nursing Society's (INS) 2011 Standards of Practice.[3-5] In other words, in this patient, there is no present indication for a central line. Yet, as it stands—despite the fact that the CDC checklist has been complied with—the patient still has a central venous access device (CVAD) in place and remains at risk of CLABSI.

What are the lessons here?

Lesson 1: Since indications for the CVAD may change daily, ask: What is the current indication? To do this effectively, you must be well informed as to what constitutes an indication for central venous access and what does not. (More on the new evidence-based indications for CVADs shortly.)

Lesson 2: Promptly replace any CVAD that is no longer indicated with a less dangerous vascular access device (e.g., a midline or peripheral IV). This action can reduce CLABSI rates significantly.[6-7]

Before looking at the emerging new evidence that is changing CVAD indications, let's first review the real risks of central venous access. This will allow us to make informed risk/benefit judgments.

CLABSI is our primary concern. Recent publications have demonstrated that the risk of CLABSI from a central line is 2-5/1,000 central line days.[8-9] You may think your institution is doing better, and it may be; but unless you are applying all the rigors of a controlled, prospective study, chances are some CLABSIs are being missed or diagnosed as something other than what they are. The other dominant risk of central venous access is deep vein thrombosis (DVT). A recent study, using excellent ultrasonography equipment and operators, disclosed that PICCs (regardless of the kind of taper they have) are associated with 71.9 percent silent DVT and short, non-tunneled CVCs are associated with 9.7 percent silent DVT.[10] Hence, the risks of central venous access—in addition to the insertion-related risks of air and guide wire embolism, bleeding and arrhythmia--are relatively common, and they can be life-threatening. The benefits of central venous access, therefore, must off-set the very real risks of CLABSI AND DVT.

And what are the benefits of central venous access? Central venous access provides single or multi-lumen access to the superior vena cava. In other words, PICCs and CVCs terminate in a very wide, thick-walled vein with very high flow rates—providing rapid hemodilution and an opportunity for the catheter tip to remain relatively distant from the intima with reduced risk of irritation, infiltration and extravasation. These advantages are especially significant for administration of high osmolar or noxious agents. No one disputes that among such agents are:

I. Total Parenteral Nutrition

II. Vasopressors (e.g. Dopamine)

III. Highly noxious agents like:

- Acyclovir
- Caffeine Citrate
- Calcium (all salt forms)
- Dextrose > 12.5%
- Doxycycline
- Mannitol 20% & 25%
- Promethazine
- Potassium >60 mEq/L
- Sodium bicarbonate
- Sodium chloride > 3%
- Many Chemotherapy Drugs[11]

For the kinds of agents listed above, the benefits of central venous access may outweigh the risks. Notice, however, what is not listed: (1) Difficult venous

access and (2) Medications with pH less than 5 (like vancomycin) or greater than 9. These two false indications are conspicuously absent. This is where recent evidence becomes important.

First, let's consider "difficult venous access." It used to be that when the visible veins of the hand and forearm were exhausted, patients automatically became candidates for central venous access. This has changed for two reasons. First, as already mentioned, is the growing awareness of the CLABSI and DVT risks associated with CVADs. Second, is the advent of ultrasound guidance which enables cannulation of the larger vessels of the upper arm, where hemodilution is five times greater than in the hand or forearm. Midline placement, and short peripheral IV (PIV) placement, into the deep vessels of the upper arm by means of ultrasound guidance is associated with a significantly lower rate of bloodstream infection and DVT when compared with CVADs (or even peripheral IVs)[4, 6-7, 12-13] Moreover, certain brands of midline catheters appear to be associated with high rates of blood drawability for diagnostic testing, without requiring the use of heparin or alteplase.[13] Thus, venous access for purposes of blood sampling and/or fluid and medication delivery (other than agents like listed above) can now be achieved using ultrasound guided midline catheters in the upper arm.[14]

> "Routine discontinuation of central lines in favor of midlines, when "access" is the sole indication, significantly reduces central line days and can reduce CLABSI rates by as much as 85.3%.

If during daily rounds you discover that the sole remaining indication for a central line is "venous access" or "poor veins, nothing left," realize that a far safer means of achieving access is now proven and available. Routine discontinuation of central lines in favor of midlines, when "access" is the sole indication, significantly reduces central line days [7] and can reduce CLABSI rates by as much as 85.3 percent.[6]

Now let's look at the pH of a medication as an independent indication for central venous access. The 2011 INS Standards require central venous access for "infusates with pH less than 5 or greater than 9."[2] In accordance with the standards, nurses and physicians throughout the country have elected to place either PICCs or CVCs to administer such medications as vancomycin, based solely on the acidic pH of that medication (pH = 3.6-3.9). It is now known that this is a "false criterion for central venous access."[3] There is, in fact, not a single peer-reviewed, published clinical trial in the English literature that supports the notion that the pH of an intermittently administered medication causes infusion thrombophlebitis.[4-5] Even if pH were a cause of vessel irritation, one might rightly argue that phlebitis does not pose a greater risk

to patients than the life-threatening risks CLABSI and DVT. But, again, the pH of a drug (acid or base) does not cause phlebitis; rather, it is the physico-chemical nature of the offending molecule and its concentration at the intimal surface that cause damage.[15] The blood and vascular system are well equipped with buffers to handle hydrogen ions (i.e., pH); they are not well equipped to handle alien molecules with direct cyto-damaging effects. Recall, intravenous erythromycin has a normal pH, and yet it often provokes striking cellular inflammation. On the other hand, vancomycin (2-5 mg/ml), one of the most acidic antibiotics, has been shown in four studies, totaling nearly 2,000 patients, to be one of the least phlebitogenic antibiotics. [4, 16-18]

If during daily rounds, you discover that the sole remaining indication for a central line is administration of a drug deemed too acidic or basic (5> pH <9) for peripheral access, consider discontinuing the line and administering the drug in question via the deep, high flow vessels of the upper arm. The evidence-base now supports this decision.

In summary, it is no longer enough to merely inquire whether a CVAD is still indicated. It must also be understood that "access" and "pH," in and of themselves, no longer constitute valid indications for central venous access. Adequate venous access can now be achieved using ultrasound guided midlines, or sometimes peripheral IVs, placed in the deep vessels of the upper arm. Similarly, while the properties of the medications/solutions being infused need to be considered, the acid/base status of a drug is longer an independent indication for a CVAD—the risks are too high, and the benefits of rapid hemodilution can be achieved using a safer vascular access device. Reduce central line days and you will reduce central line infections. [6-7, 19-20] ICT

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For references, see the online version of this article at www.infectioncontroltoday.com