The 2001 Needlestick Safety and Prevention Act is clear: Safety devices, like needleless system connectors used as part of an infusion system, must be used to comply with Occupational Safety and Health Administration regulations. Although needleless infusion connectors prevent accidental exposure to bloodborne pathogens by healthcare workers, recent research associates their use with increased rates of catheter-related bloodstream infection (CR-BSI).

Millions of I.V. catheters are inserted annually in all care settings. One long-recognized complication of vascular access is infection; a direct opening into the vascular system makes a direct portal for pathogens to enter the bloodstream if prevention measures aren’t taken. The risk is especially pronounced in critical care patients. Approximately 80,000 central venous access device (CVAD)-related CR-BSIs occur in U.S. ICUs alone each year, at an estimated cost per infection of $34,508 to $56,000.1,2 (Overall, an estimated 250,000 CVAD-related CR-BSIs occur annually, with an attributed mortality of 12.5% to 25% per occurrence. The approximate national cost of treating CR-BSI is $25,000 per infection, or $296 million to $2.3 billion.)3

While the number of CR-BSIs has remained relatively steady, vascular access device use has burgeoned, especially in nonhospital settings. With the “routine” use of these invasive devices, it’s all too easy for nurses to develop more cavalier attitudes regarding I.V. care.

Device history
The first needleless system connectors consisted of a split septum cap, which could be accessed with a blunt cannula (in lieu of a needle). These needleless devices were also prone to contribute to catheter occlusion.
Because these systems have a “dead space” to accommodate the cannula, failing to properly use positive pressure flush technique or use a clamp on connections of this system can allow blood to back up into the patient’s infusion catheter, increasing the risk of interruptions in therapy and elevating infection risk. They can also be mistakenly used with standard hypodermic needles.

The next generation of needleless connectors was the luer-activated device (LAD). It incorporates a valve that prevents the outflow of fluid through the connector until a standard luer connector is inserted into the connector, allowing the valve to open so fluid can be inserted or withdrawn. Some LADs require a cap to be attached to the valve when not in use. The cap is necessary to maintain asepsis between uses. These are difficult to maintain aseptically, as contamination can easily occur during manipulation. It’s possible to easily swab the fluid pathway with antimicrobial solutions to prevent pathogen migration into the system.

Other capless LADs must be cleaned with an antiseptic swab prior to use. Again, many of these devices allow a small amount of blood to be aspirated back into the patient’s vascular access device if care isn’t taken to use a positive pressure technique to flush the patient’s line, and to maintain this by closing the clamp on the catheter while disconnecting the flush syringe from the needleless connector.

Later generation LADs addressed the occlusion issue by incorporating positive pressure or neutral displacement to either flush out aspirated blood or prevent its aspiration into infusion catheters. These devices usually don’t require heparinization or the use of positive pressure technique. In fact, if positive pressure flushing technique is used with catheters with integral valves, the risk of occlusion may rise, as the valves are held open, allowing retrograde blood flow into the catheters with patient movement and changes in intrathoracic pressure.

Addressing concerns
Concern about the link between needleless valves and CR-BSI isn’t new. Studies published in the 1990s revealed a number of issues that could potentially lead to increased infections, including mainly, not changing needleless devices according to manufacturers’ recommendations.4,5 Issues raised by these studies did seem to be addressed through staff education and improved compliance. In fact in 2002, CDC Guidelines for the Prevention of Intravascular Catheter-Related Infections stated “when devices are used according to manufacturers’ recommendations, they do not substantially affect the incidence of CRBSI.”6

However, since 2004, new concerns linking needleless access devices with bacteremia have re-emerged, with numerous presentations, posters, and/or abstracts presented at annual meetings such as the Society for Healthcare Epidemiology of America (SHEA), the Association for Professionals in Infection Control and Epidemiology (APIC), and the Association for Vascular Access (AVA). Much of the information presented on this topic arises from poorly designed, quasi-experimental studies and from anecdotal, retrospective reports from single institutions. Until more conclusive, well-designed studies are published that definitively determine the optimal design and mechanism of action for needleless system devices, clinicians should take the following steps to reduce the potential for CR-BSI:

- Follow CDC Hand Hygiene Guidelines.
- Vigorously swab all needleless system connectors with antimicrobial swabs prior to connecting syringes or infusion sets.
- Prospectively monitor all infusion therapy and vascular access outcomes and establish an action plan to address any deficiencies.
- Review infusion therapy policies and procedures to ensure that they’re up to date and reflect current CDC Guidelines for the Prevention of Intravascular Catheter-Related Infections and the Standards of Practice for Infusion Therapy from the Infusion Nurses Society.

Invest in staff education and awareness programs to improve infusion therapy skills and make nurses aware of correct ways to care for vascular access devices.
Frequently review new infusion products and product literature for product improvements and track published studies regarding innovations in infusion therapy and infection control.

Invest in staff education and awareness programs to improve infusion therapy skills and make nurses aware of correct ways to care for vascular access devices. The AVA has a well-designed, evidence-based program entitled SAVE That Line!, which is available online at http://www.avainfo.org.

REFERENCES

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