THE ROAD TO ZERO
Reducing the incidence of central line–associated bloodstream infections and needlestick injuries
INTRODUCTION
As the number of central venous catheter (CVC) procedures grows, so does the risk of infection and sharps injury. With each central line–associated bloodstream infection (CLABSI), hospital stay lengthens, thus increasing the demand on valuable resources including staff time, diagnostics, laboratory costs and therapy to treat the infection. The cost of needlestick injuries to healthcare workers is difficult to quantify because many go unreported, but it is estimated to be significant. Infections, such as HIV and hepatitis, that result from sharps injuries are also associated with a devastating emotional impact. In an effort to prevent infection and injury during CVC insertions, guidelines/standards have been put into place by the Centers for Disease Control and Prevention (CDC), the Institute for Healthcare Improvement (IHI), the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), the Occupational Safety and Health Administration (OSHA), and the Infusion Nurses Society (INS). An all-inclusive CVC insertion kit designed to accommodate these guidelines can help protect against infection and injury and help to eliminate their associated costs.

CLABSIS AND NEEDLESTICK INCIDENCES ARE RISING
The number of CVC insertions in intensive care units (ICUs) has steadily increased over the last several years, and it is estimated that 90% of catheter-related bloodstream infections (CRBSIs) result from CVC insertion procedures. The CDC estimates the incidence of these bloodstream infections to be approximately 248,000 per year in US hospitals. While the exact pathogenesis of CLABSIs is the subject of ongoing research, it is believed that introduction of bacterial and fungal organisms into the body via the skin is a common cause in short-term catheterization, and infection in long-term catheterization may result from contamination of the catheter hub.

In addition to CLABSIs, CVC insertion procedures regularly put clinicians at risk for needlestick (and other sharps injuries) and exposure to bloodborne pathogens. The true incidence of sharps injuries is impossible to count due to underreporting. However, estimates put the number at approximately 385,000 needlestick and other sharps-related injuries per year among hospital employees in the United States. The majority of healthcare workers affected by sharps injuries are nurses and nursing staff, but doctors, laboratory staff, janitorial staff and other healthcare workers are also at risk.

THE REAL COST OF CLABSIS AND NEEDLESTICK INJURIES
With every CVC placement, there are risks for both the patient and clinician. In addition to the immediate effects of CLABSIs and sharps injuries associated with CVC procedures, there is a significant financial impact on the patient, clinician and hospital. Bloodstream infections (central line–associated and otherwise) contracted in the healthcare setting extend a patient’s hospital stay an average of 7 days and are estimated to cost between $3700 and $29,000. An estimated 500 to 4000 patients in the United States die annually as a result of healthcare-acquired bloodstream infections. While many sharps injuries go unreported, OSHA estimates that needlestick injuries account for nearly 80% of accidental exposures to blood.

Both CLABSIs and needlestick injuries have an obvious financial impact, but the overall cost of needlestick and other sharps injuries reaches beyond the immediate. Some indirect costs include lost productivity, the time that multiple providers and supervisors may spend evaluating and treating the affected clinician, and time spent evaluating and treating the source patient. Long-term complications of needlestick injuries, including HIV and hepatitis infections, can cost hundreds of thousands of dollars to manage—but the emotional and psychological effects of a potentially life-threatening infection contracted from accidental blood exposure are impossible to quantify.

BARRIERS TO PREVENTION
Although the benefits of prevention often outweigh the cost, rates of infection and injury are still high. Lack of awareness and education are partly to blame, along with the fact that most clinicians are untouched by the fallout of potentially deadly CLABSIs, as these infections are typically managed by someone other than the catheter insertion team. There is little perceived risk by those who are on the front line of this issue. For this reason, the CDC, SHEA/IDSA, IHI, OSHA and INS all recommend that hospitals and other healthcare employers provide CLABSI and/or sharps injuries prevention education for clinicians and healthcare workers.

UNDERSTANDING ISSUES LEADING TO INFECTION AND INJURY
To resolve the issues that increase the risk for CLABSIs and CVC-related needlestick injuries, it is first important to understand how CVC procedures are performed by individual clinicians. Observational research and interviews sponsored by Arrow International (a subsidiary of Teleflex...
Incorporated) were conducted in several US hospitals. The research focused on 6 intensive care units, 3 operating rooms, 1 preoperation holding room, 1 emergency room and 1 patient room. Clinicians were observed and recorded during CVC procedures, and the following were analyzed:

- Timing and sequencing of tasks
- Ease of use of current instruments
- Areas that present challenges to instrument use

The results culminated in recommendations for several improvements to current CVC insertion kits. These recommendations are intended to increase efficiency and safety; reduce sharps injuries; and help prevent CLABSIs per CDC, SHEA/IDSA, OSHA and IHI guidelines.

INSERTION KIT ISSUES LEADING TO INFECTION AND INJURY

The research team discovered issues in 3 categories related to current kits during CVC procedures: storage, usage and disposal.

STORAGE

Because the packages were often oriented where the label was not in view, clinicians had difficulty identifying the appropriate kit (Figure 1). Although CVC kits can be customized to different hospitals, users did not always know which additional components they needed. When additional components were needed for a procedure, clinicians spent valuable time searching for items not included in the kits (Figure 2). Furthermore, some components were dislodged from the kit tray during storage, increasing insertion procedure time and causing potential damage to the instruments. The kits in a Tyvek® bag made stacking and catheter identification difficult, if not impossible. Finally, the size of current kits made storage in smaller compartments and baskets difficult.

USAGE

Layered and overlapping components made instruments difficult to retrieve from kits. Clinicians had trouble grasping the instruments during the procedure because the instruments were not always oriented the way the clinician would expect to grasp them. As a result, most users removed all items from the kit and rearranged the components on the work surface before the procedure. Clinicians often used foam cups for temporary sharps storage, although doing so caused them to look away from the insertion site. During the procedure, clinicians also expelled blood from syringes into the tray, causing clotted blood to stick to instruments in the kit and putting the clinician at risk for exposure to splattered blood (Figure 3). Saline storage was also an issue. After clinicians used the kit tray to store saline during the procedure, they had to tilt or manipulate the tray to retrieve the fluid, which could compromise instrument sterility.
At the end of each procedure, rather than disposing of sharps and other waste separately, clinicians incorrectly placed the kit tray and all items in large sharps bins, which could add additional costs to the facility by increasing the weight of the bins (Figure 4). Some picked through the instruments in the kit to separate the sharps, causing exposure to potential needlestick injuries and bloodborne pathogens. Upon disposal of the kit, many clinicians piled used instruments on the plastic trays, which were weighed down with saline and blood, and carried them across the room, risking spills and dropped instruments.

THE ARROW® ERGOPACK™ SYSTEM SOLUTION

Based on the results of this research, ARROW ErgoPack System packaging was redesigned to increase efficiency and safety; meet CDC, SHEA/IDSA, INS and IHI guidelines for helping to protect against CLABSIs and needlestick injuries; and adhere to recommendations detailed in OSHA’s Bloodborne Pathogens Standard.

STORAGE

An improved packaging label on the ErgoPack System and a smaller, more streamlined size allow the kit to be stored and easily recognized on a shelf or in a basket. Instruments are secured in the tray to avoid displacement during transportation. The tray is compact and easy to transport, and it fits neatly on a variety of surfaces, including patient tables and carts. The durable, recyclable outer packaging protects the kit and its components from damage and contamination. The firm plastic base also allows the kits to be stacked without risk of falling. Important component pictures are shown on the packaging to help quickly identify major kit contents.

USAGE

The ErgoPack System was designed to encourage compliance with CLABSI- and sharps stick–prevention guidelines/standards. Infection protection and sharps safety components are placed at strategic points in the kit to ensure compliance with recommended guidelines. A sterile hand towel and alcohol-based hand gel are included, encouraging good hand hygiene and reducing the need for hand hygiene assistance during the procedure. As an additional preventive measure, a stop sign door-hanger is included to alert other staff members that a sterile procedure is in progress. Instruments in the ErgoPack System are organized in a single layer from left to right, in the order they would typically be used (Figure 5). Redesigned kits have enough space surrounding the instruments to accommodate the finger size of a majority of the population. The instruments are oriented more intuitively, pointing away from the user. The new kits provide temporary sharps storage, a sealed blood collection area to keep the sterile field clean and dedicated saline storage for easy retrieval during a procedure.
DISPOSAL
The SharpsAway™ disposable cup allows for a temporary holding place for used needles. Once the procedure is complete, the needles can be transferred to the SharpsAway II disposable locking sharps cup (Figure 6). This cup is designed to lock the needles so they cannot be removed once inserted into the cup, and the cup can then be safely placed in the sharps bin. Additionally, the HemoHopper® provides a safe way to sequester blood and bodily fluids prior to disposal in the biohazard bin (Figure 7).

THE ERGOPACK SYSTEM MEETS BEST PRACTICE GUIDELINES/STANDARDS
The ARROW ErgoPack System is an ergonomic packaging system designed to efficiently facilitate compliance with best practices, evidence-based medicine, and guidelines and recommendations to help reduce the risk of CLABSI related to vascular access procedures. The system facilitates best practices according to recommended insertion guidelines/standards of the CDC, SHEA/IDSA and INS.

<table>
<thead>
<tr>
<th>COMPONENTS IN THE ERGOPACK SYSTEM</th>
<th>OSHA²</th>
<th>CDC³</th>
<th>SHEA/IDSA⁴</th>
<th>INS⁵</th>
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<td>Sharps safety</td>
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<td>Safety scalpel</td>
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*Indicates compliance with OSHA’s Bloodborne Pathogens Standard.²
ADDITIONAL INFECTION PROTECTION AND INJURY PREVENTION MEASURES

- HemoHopper fluid receptacle
- Stop sign door-hanger

INCREASED EFFICIENCY

- Procedural checklists (meets SHEA/IDSA practice recommendations)
- Streamlined packaging with images of kit components
- Raulerson syringe—a closed vascular insertion syringe
- Hospital’s ability to customize kits similar to the ErgoPack System research
- SharpsAway system (red color) prevents the clinician from having to look for a place to put sharps

THE ERGOPACK SYSTEM ADVANTAGE

Because the costs of CLABSIs and sharps injuries are so high, it stands to reason that reducing these types of infection and injury can help hospitals and other healthcare institutions avoid their associated costs. The ErgoPack System is an ergonomic packaging system designed to efficiently facilitate compliance with best practices, evidence-based medicine, and guidelines and recommendations to reduce the risk of CLABSIs and sharps sticks related to vascular access procedures. Its ergonomic and intuitive design increases efficiency and promotes safe insertions for both clinician and patient. When the ErgoPack System contains ARROWg+ard Blue PLUS or Chlorag+ard catheters, it can provide protection against the 5 sources of CLABSIs:

- Environmental contamination\textsuperscript{17,18}
- Skin flora\textsuperscript{3}
- Postplacement subcutaneous tract infection\textsuperscript{19}
- Intraluminal contamination\textsuperscript{20}
- Hematogenous seeding\textsuperscript{21,22}

CONCLUSION

The goal of zero CLABSIs is attainable. By increasing efficiency, promoting safety through clinician education and reducing infection risk through aseptic insertion measures, CLABSIs and needlestick injuries during CVC procedures may be reduced. By following the recommendations put forth by the CDC, SHEA/IDSA, INS, IHI and OSHA, the newly designed, all-inclusive ARROW ErgoPack System can assist hospitals and clinicians in achieving reduced rates of infection and sharps injury, thereby reducing their associated costs.

CONTACT TELEFLEX TO LEARN MORE ABOUT THE ARROW ERGOPACK SYSTEM

Visit ArrowErgoPack.com or e-mail ArrowErgoPack@teleflex.com.

To speak with an ARROW customer service representative or have a sales representative contact you, call 1.800.523.8446.

ABOUT TELEFLEX

Teleflex is a global provider of medical devices used in critical care and surgery. It serves healthcare providers in more than 130 countries with specialty devices for vascular access, general and regional anesthesia, urology, respiratory care, cardiac care, and surgery. Teleflex also provides products and services for device manufacturers.