Presented is a study of phlebitis and infiltration rates within an institution following the conversion to a standard intravenous (IV) start kit that included chlorhexidine gluconate with isopropyl alcohol, a new site dressing, and IV securement cushions. Included are cost comparisons and support rationale used in the purchase of the kit. The total number of intravenous sites examined was 1,345. Using current nursing staff, peripheral IV phlebitis and infiltration rates were virtually eliminated and dwell times were extended from 72 to 96 hr.

The challenge of providing excellent infusion nursing care in a state where Medicare reimbursement for care is minimal can seem overwhelming. Clinicians at a 700-bed facility in the Midwest require a great deal of justification to approve any product changes or additional employees.

The facility’s “intravenous (IV) team” was disbanded in 1993. The team had been small, and duties were limited to difficult peripheral IV starts, peripherally inserted central catheter (PICC) insertions, and nursing education. In 1997 an infusion clinician was hired primarily to provide education in vascular access care. It was apparent that nurses had developed their own techniques for peripheral IV starts after the loss of the IV team. Skin preparation, site dressings, taping, and tourniquet use varied significantly.

The U.S. Centers for Disease Control and Prevention (CDC) made the following statement in their 2002 Guidelines for the Prevention of Intravascular Catheter-Related Infections (1):

“Reports spanning the past two decades have consistently demonstrated that risk for infection declines following standardization of aseptic care, and that insertion and maintenance of intravascular catheters by inexperienced staff might increase the risk for catheter colonization and CRBSI [catheter related bloodstream infection]. Specialized ‘IV teams’ have shown unequivocal effectiveness in reducing the incidence of catheter-related infections and associated complications and costs. Additionally, infection risk increases with nursing staff reductions below a critical level” (p. 5).

Reinstituting an IV team was the most appropriate response to this situ-
Rationale for this decision included:

1. General duty nurses were accepting full responsibility for patients’ IV access from initiating and monitoring the IV and solutions through discontinuing use of the device.
2. A considerable number of nurses had developed skills in performing these tasks.
3. The Intravenous Nursing Society’s (INS) Standards of Practice (2) stated that “an organization that fails to maintain an ongoing phlebitis rate of 5% or less with the practice of 72-hour catheter site rotation should return to a 48-hour site rotation interval” (p. S50). This hospital demonstrated phlebitis rates in February and December 2002 of 3% and 4%, respectively. Although lower rates are always preferable, the rate was within an acceptable range.

The routine procedure for the institution’s peripheral IV starts in 2002 included use of an IV tray, which included the following items: a tourniquet, sterile 2 x 2-in. gauze pads, IV catheters in a variety of sizes, tape, sterile 70% alcohol pads, extension tubing with a needleless valve, and sterile povidone-iodine pads. The nurse performing the procedure would take the tray to the patient’s bedside for the IV start and then return the tray to the nursing station. Nurses followed their own preferred techniques using the items on the tray. Dressings applied on the IV sites included combinations of tape and a transparent dressing. One IV tray was maintained for each hospital wing, or approximately 20 patients. This practice raised obvious concerns regarding the spread of infectious disease. According to the CDC (1), “Migration of skin organisms at the insertion site into the cutaneous catheter tract with colonization of the catheter tip is the most common route of infection for peripherally inserted, short-term catheters” (p. 5). The INS’s Standards of Practice (2) recommended, “The tourniquet should be single-patient use due to the potential for microbial cross-contamination between patients” (p. S36). The tourniquet on the IV tray was reused on a number of patients.

The trial of a sterile, single-use IV start kit was proposed to create a standard procedure and provide a consistent use of materials for all IV starts. The facility set several goals and objectives: first, to standardize IV start materials and procedures; second, to reduce phlebitis rates; and, third, to do all of this with existing nursing staff.

### METHODS

Nursing departments tested a variety of kits offered within this hospital’s buying group and felt that the Centurion IV Securement Kit (Tri-State Hospital Supply, Howell, MI) was the best choice (Figure 1). This kit featured a window dressing that the nurses determined to be the most comfortable and adherent. The kit included a prep of 2% chlorhexidine gluconate (CHG) with 70% isopropyl alcohol. Kit manufactured by Tri-State Hospital Supply (Howell, MI).

#### Table 1

<table>
<thead>
<tr>
<th>“Real Cost” Effective</th>
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<tbody>
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<td><strong>Components without Kit:</strong></td>
<td><strong>Components in Kit:</strong></td>
</tr>
<tr>
<td>Extension set with needleless valve, gauze, transparent dressing, tape, tourniquet, Alcohol, Povidone-Iodine</td>
<td>Customized IV Securement Kit including extension set with needleless valve, window dressing, securement strips and CHG</td>
</tr>
<tr>
<td><strong>Total Annual Cost:</strong></td>
<td><strong>Total Annual Cost:</strong></td>
</tr>
<tr>
<td>$555,840</td>
<td>$367,200</td>
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<tr>
<td><strong>Annual Real Cost Savings:</strong></td>
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<td>$188,640</td>
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associated with IV lines (3–6). The kit also contained catheter securement cushions, a tape strip, \(2 \times 2\) gauze, a latex-free tourniquet, and an extension set with needleless valve.

The nursing staff reported an immediate benefit of this new IV securement kit in improved site visibility, as only one small strip of tape was used proximal to the dressing for added securement. The CDC guideline (1) from 2002 also stated, “Transparent dressings reliably secure the device, permit continuous visual inspection of the catheter site…and require less frequent changes than do standard gauze and tape dressings; the use of these dressings saves personnel time” (p. 7). Though the previous dressing had been transparent, visibility had been obscured at times by various taping methods.

To achieve support and compliance in the purchase and use of the kit, brief presentations were given to educate directors as to the intent of the kit. The product buyers agreed with the concept of an IV start kit but felt the additional costs would be excessive. However, once the cost of each item used in the current procedure was compared with the cost of the new kit, the buyers were able to illustrate a significant cost savings of 34% annually, or $188,640 (see Table 1). With the potential advantages of improved care and actual cost savings, the purchasing, supply, nursing and radiology directors were very supportive in implementing the kit.

RESULTS

The kits arrived in January 2003. The manufacturer provided hands-on training in the appropriate use of the kit at various sites and times. Consistent kit usage throughout the hospital was achieved by March 2003.

The outcome was monitored by assessing the phlebitis and infiltration rates at approximately 6-month intervals. These assessments were performed randomly on approximately 250 patients per assessment (nurses were not informed about upcoming assessments; they were unexpected). Phlebitis was almost eliminated and the infiltration rate was zero (see Chart 1 and Table 2).

After the new kit was in use consistently throughout the hospital, dwell times were extended from 72 hr to 96 hr in March 2003. The CDC guidelines (1) stated, “In adults, replace short, peripheral venous catheters at least 72–96 hours to reduce the risk for phlebitis” (p. 9). Because the phlebitis rate had been acceptable prior to initiating the IV securement kit, administrators decided to make this change after the success of the kit.

DISCUSSION

One reason for the improved outcomes is likely the fact that the catheter was stabilized more securely by consistently using the catheter securement strips provided in the kit (Figure 2).

If you don’t secure a catheter to prevent it from ‘pistoning’ in and out of the insertion site, your patient is at risk for developing thrombotic complications, mechanical phlebitis, and catheter tip malposition. Skin organisms can also contaminate the catheter’s external portion, introducing pathogens directly into the bloodstream if the catheter migrates into the insertion site” (7; p. 13).

There is also a reduced risk of infection by introducing CHG into the site-prepping protocol, along with providing a process improvement in technique by using the sterile kit during the placement of the peripheral venous device.

In addition to real cost savings, the reduction in phlebitis rates added a soft cost savings to the hospital by reducing unscheduled restarts and other expenditures associated with such complications. Nursing time per procedure decreased from an average reported time of 25 min without the kit to 15 min with the new kit. Extending the dwell time from 72 hr to 96 hr also decreased costs in both nursing time and materials.

Patients benefited from increased comfort, fewer restarts, and a more comfortable site; nursing reported a lower incidence of skin tearing with the window dressing than with the previous dressing.
prior transparent dressing that had been used.

**CONCLUSION**

The implementation of a standardized protocol for all IV starts allowed the hospital staff to meet and exceed their objectives: using current nursing staff, they virtually eliminated peripheral IV phlebitis and maintained an infiltration rate of zero while extending dwell times. The use of a sterile, single-use IV securement kit containing a window dressing, catheter securement cushions, CHG, and isopropyl alcohol improved outcomes and reduced both real and soft annual costs to the hospital. The reimplementation of a specialized IV team was proven unnecessary; instead, the hospital was able to realize cost savings while improving infusion nursing care.

**RESULTS**

**Phlebitis Rates**
- Virtually eliminated at time of multiple assessments

**Infiltration Rates**
- Zero at time of multiple assessments

**Hard Cost Savings**
- Annual real cost savings of 34% or $188,640

**Soft Cost Savings**
- Nursing time decreased from an average of 25 min to 15 min per procedure
- Reducing phlebitis rates resulted in lower expenditures and fewer unscheduled restarts
- Extending catheter dwell time protocols saved nursing time and materials
- Standardization of protocol and improved site prepping reduced risk of costly infections
- No need to hire additional nursing staff

**Patient Benefits**
- Increased comfort: fewer site complications, skin tears and unscheduled restarts
- Increased safety: lower risk of infection

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**REFERENCES**


6. Meffre, C, Girard, R, et al. (1996). Povidone-iodine vs alcoholic chlorhexidine for disinfection of the insertion site of peripheral venous catheters: Results of a multicenter randomized trial. *Infection Control and Hospital Epidemiology*; 17 (Suppl. 2), A64.