For as long as patients have had central venous catheters (CVCs), infections have occurred. It's one of the risks of inserting a foreign object through the skin into the vascular system. Many in the alternate-site and home infusion settings would say that we have lower rates of catheter-associated bloodstream infection (CA-BSI) when compared to the hospital and the ICU. In reality, there are several potential problems with this mindset.

First, given the challenges of collecting and reporting catheter infection data in the home, how accurate are our rates? With any manual process, errors of omission can be high. Add to that the challenge of adequately documenting what happens to patients who enter other health care settings for CA-BSI or other problems. Our patients may return home or they are lost to follow-up and we have incomplete data.

Secondly, what are the benchmarks for CA-BSI for the home infusion setting? Our goal should be zero infections, but what is acceptable based on patient variables and similar provider information? We don’t really know.

The Impact of CA-BSIs
It is important to understand the significance in cost and human suffering related to this preventable problem. A 2007 study found that, in 2002, 1.7 million hospital-acquired infections were associated with 99,000 deaths.¹ In 2000, The U.S. Centers for Disease Control and Prevention (CDC) estimated that hospital-acquired infections added nearly $20 billion to U.S. health care costs annually.² Yet, a 2007 Leapfrog Group survey of 1,256 hospitals found that 87 percent of those hospitals do not consistently follow recommendations to prevent many of the most common hospital-acquired infections.³

Drilling down to catheter infections, 90 percent of bloodstream infections are believed to be caused by CVCs.⁴ Over 48 percent of ICU patients have CVCs and we know most of our home infusion patients need this important access.⁵ The additional cost of treating a bloodstream infection has been estimated between $3,700 and $29,000.⁶ Also, increased morbidity and mortality has been documented, with one in five ICU patients dying from this adverse event.⁷ Beyond the
**Home Infusion Catheter Infection Surveillance Example**

A home infusion company (500 patient visits per month) tracks catheter infections by using an "incident" report form. The number of infections is reviewed on a quarterly basis in the quality improvement (QI) meetings to see if there are any trends. For the last five years the provider has averaged between one and three documented infections per year. Review of these patient records indicated multiple risk factors but no identifiable trends. This quarter the provider has three documented (positive blood cultures) BSIs. The QI coordinator brings this data to the attention of management staff. The next steps in assessing this information may include answering the following questions:

- What are the results? Are they the same microbe, or all different?
- Have there been any changes in procedures or clinical staff (in-house and contracted)?
- Have the patients been recently hospitalized or in another health care facility?
- What are the risk factors for these patients (history of prior CA-BSI, immune-compromised disease process, etc.)?
- Have there been any reported problems with infusates, flushes, etc?
- Have there been any changes in delivery process?
- Have there been any changes in pharmacy preparation processes?
- Have the storage procedures in the patient’s home been assessed?

Assessing the answers to these questions may lead to an action plan for resolution, or the determination that these are isolated incidents.

dollars, as clinicians we know that a long-term home infusion patient who loses a CVC to infection faces the challenge of finding a new access site. Loss of access may lead to loss of life-sustaining therapy.

Prevention of infection has become an issue of great importance to the U.S. Department of Health and Human Services. A number of state legislatures have enacted or are in the process of enacting legislation regarding the reporting of health care-related and community-acquired infection. The Centers for Medicare and Medicaid (CMS) recently changed its reimbursement policy, stopping payments for certain preventable, health care-acquired conditions (HAC), including health care-associated infection (HAI). In fact, of the HACs on CMS’s list, more than half are related to infection.

While this rule, effective October 1, 2008, only affects hospitals, beginning October 1, 2009 it will affect other providers, such as dialysis centers and outpatient services. This marks a change for CMS from a passive payer to a value-based purchaser of health care services. Unsustainable increases in cost, uneven quality of care, and unjustifiably high rates of medical errors have led to this decision.

CMS officials have stated that expansion of the agency’s new payment provisions to other settings is currently under consideration. How will we, as home infusion providers, respond? The first step is to develop consistent definitions which has been done. The Association for Professionals in Infection Control and Epidemiology, Inc. (APIC) and CDC’s Healthcare Infection Control Practices Advisory Committee (HICPAC) issued APIC – HICPAC Surveillance Definitions for Home Health Care and Home Hospice Infections in February of 2008. This group included a definition for Bloodstream Infections (BSI) related to intravascular catheters. See www.nhia.org/BSI 

The next step could involve a mandatory reporting requirement from CMS similar to the Outcome and Assessment Information Set (OASIS) for Medicare-certified home health agencies. Similar to OASIS, the process could progress in steps: collect the data, assess the data, benchmark, and pay for performance. Will the non-reimbursement of services for patients with health care-acquired conditions in the home be next? If so, how far behind are private payers? Home infusion providers must prepare for the future, beginning with the establishment of a catheter infection surveillance, prevention, and treatment program.

**Getting Started with Home Infusion Surveillance**

The incidence of catheter-associated bloodstream infection in home care is unclear. There is little data, and most of what has been published is retrospective or concurrent review. Exhibit 1 summarizes the data available from published studies of catheter complications in the home setting. However, caution must be used when comparing these rates, as definitions of what constitutes a CA-BSI, or what is reported, may differ between studies and from the new APIC-HICPAC surveillance definitions.

Where do home care providers begin as they seek to obtain this data from their own patient populations? There’s a longer record of data collection in the acute care setting, so we can begin by looking there. Acute care settings rely on the National Healthcare Safety

**Exhibit 1 - Rates of CA-BSI From Home Infusion-Based Reports**

- 0.19 infections per 1,000 catheter days
- 0.77 infections/1,000 catheter days
- 0.24 infections per 1,000 catheter days
- 0.16 - 6.77 infections per 1,000 catheter days
The Patient Safety Component of NHSN allow s entry and graphs to statistical analysis that compares a facility’s rates with national performance measures.

While there is currently no NHSN or equivalent for home care, there are plans to expand the database to other health care settings. Efforts within our industry to initiate surveillance systems also exist. The Missouri Home Care Alliance began a program in 1997 to develop definitions and collect data from home care agencies in Missouri and other states.\(^1\) With assistance from CDC’s Hospital Infections Program, the alliance has made progress in developing a surveillance system and sharing data. This year, their surveillance definitions will be updated to match those recently issued by APIC-HIPC PAC.

Data collection has traditionally been more difficult in home care. But, with new surveillance definitions, our ability to compare data across organizations will be greatly improved. Other challenges remain. For example, surveillance methods routinely used in acute care, such as cultures and lab tests, are not always practical in home care. There are few to no infection prevention personnel available to review records and assess cases—infection control functions are usually responsibilities added on to the job duties of a quality assurance coordinator or other staff member. And, home infusion providers currently lack a centralized repository for the data they do collect—funding for such an initiative will be needed.

Questions that frequently arise around data collection in home infusion include the following:

- How do we compare data from long-term catheters to short-term catheters?
- Can providers with small patient populations be compared to larger providers?
- How do we account for the multiple variables in the home setting, including who provides the access device care?
- How will we define an infection recurrence vs. a new infection?

Perhaps a tiered approach is the best way to start. First, the home care nurse identifies and reports patients with clinical signs and symptoms of infection. This would require training and a data collection tool (see Exhibit 2) that would be used consistently. The
information from the data collection tool would be directed to the performance improvement coordinator (or infection prevention practitioner) for review and application of definition (see Exhibit 3). This information would be tracked and trended within the organization (see Exhibit 4).

Patient care practices to reduce risk must be based on clinical research or evidence-based practice and incorporated into policies and procedures. Implementing a change in practice requires ongoing assessment, preferably comparing results before and after a change. This may not always be possible when implementing a new system, especially if there are multiple variables.

Using Evidence-Based Practices to Improve Patient Care in the Home

In the acute care setting, “bundles” have been created consisting of groups of evidence-based interventions for patients with central catheters. When implemented together, these interventions result in better outcomes than when implemented individually. These “bundles” were conceived by the Institute for Healthcare Improvement (IHI), a non-profit organization with a mission to improve health care throughout the world. For more information regarding the “bundle” for intravascular catheters in acute care, please visit www.ihi.org/IHI/Programs/Campaign/CentralLineInfection.htm.

While there are no evidence-based “bundles” specific to home care, standards of hand hygiene, maximal barrier precautions for insertion of peripherally inserted central catheter lines, and chlorhexidine skin antisepsis for central line insertion are common in all sites of care. Until home infusion providers have a pool of data with which to measure effectiveness of best practices, we must evaluate the practices currently employed in acute care and assess their applicability to our setting. Prevention of the infection is always preferable to treatment. While it is not within the scope of this article to describe specific catheter infection prevention or treatment initiatives, such guidance is available from sources such as the Infusion Nurses Society Infusion Nursing Standards of Practice.

In conclusion, surveillance, data collection, and analysis are critical to the adoption of best practices. The “evidence” in evidence-based practice is lacking in the home infusion setting. Providers will need to adopt the new surveillance definitions as they move toward a universal methodology for identifying and classifying CA-BSI in the home. As new products or procedures are implemented, “before” and “after” data must be com-

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**Exhibit 3 - Central Line Quarterly Summary**

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
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<tbody>
<tr>
<td>Year</td>
<td></td>
<td></td>
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<tr>
<td># Active patients this quarter</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Total Catheter Days this quarter</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># Patients with central lines</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ACCESS DEVICE EVENTS**

- Phlebitis
- Loss of Patency
- Extravasation
- Catheter Site Infection
- Primary Bloodstream Infection
- TOTAL
- Rate/1000 Cath Days

<table>
<thead>
<tr>
<th>ACCESS DEVICE EVENTS</th>
<th>Phlebitis</th>
<th>Loss of Patency</th>
<th>Extravasation</th>
<th>Catheter Site Infection</th>
<th>Primary Bloodstream Infection</th>
<th>TOTAL</th>
<th>Rate/1000 Cath Days</th>
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<tbody>
<tr>
<td>Central Catheter (tunneled)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Central Cath (non-tunneled)</td>
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<tr>
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<tr>
<td>Port: Chest</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PICC</td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>Other</td>
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<tr>
<td>Quarter Total</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Rate/1000 Cath Days</td>
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<td></td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

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**Exhibit 4 - Example Trend Graph**

- Central tunnelled
- Port
- PICC

<table>
<thead>
<tr>
<th>Quarter</th>
<th>1st Qtr</th>
<th>2nd Qtr</th>
<th>3rd Qtr</th>
<th>4th Qtr</th>
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</thead>
<tbody>
<tr>
<td>Rate/1000 days</td>
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<td>1st Qtr</td>
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<td>2nd Qtr</td>
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<td></td>
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<tr>
<td>3rd Qtr</td>
<td></td>
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<td></td>
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<tr>
<td>4th Qtr</td>
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</tbody>
</table>
pared to evaluate effectiveness. Reporting this data internally allows individual providers to make evidence-based practice decisions, but publishing the data externally will help the entire industry to establish standards of practice that promote the best patient outcomes.

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References

Recommended Reading