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HealthLine

Focus on Central Line-Associated Bloodstream Infections

- by Allen Lefkovitz

Medical care commonly involves the use of indwelling devices [e.g., indwelling urinary catheters, peripheral catheters, central venous catheters (CVC) including peripherally inserted central catheters (PICC)]; however, indwelling devices carry significant risk of healthcare-acquired infections (HAIs) such as urinary tract infections, pneumonia, and bloodstream infections (BSI). Central lines or CVC are some of the most frequently implicated causes of BSI. BSI have a mortality rate ranging from 16-40%, but when central lines or CVC contribute to a BSI, they are associated with a 2.27-fold increase in mortality.

The Centers for Disease Control and Prevention (CDC) describes central line-associated bloodstream infections (CLABSI) as follows: "When a tube is placed in a large vein and not put in correctly or kept clean, it can become a way for germs to enter the body and cause deadly infections in the blood." Technically, catheter-related bloodstream infections (CRBSI) and CLABSI are similar but not interchangeable terms. While CRBSI is a clinical definition used in diagnosing and treating patients, CLABSI is used for surveillance purposes and is a primary BSI in a patient that had a central line within the 48-hour period before the development of the BSI. More in-depth definitions and specific surveillance parameters from CDC can be found at www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf.

CRBSI or CLABSI unnecessarily increase hospital lengths of stay and hospital costs. It has been suggested that CLABSI may increase the risk of mortality by 18% and length of stay in ICU by 13 days. Likewise, patients with CLABSI have been found to be 1.7 times more likely to experience a 30-day readmission, providing yet another impetus for reducing the rate of CLABSI. With these statistics in mind, it is easier to understand why the National Quality Forum consider CLABSI "one of the most deadly HAIs". Research in 2011 estimated that 65-70% of catheter-associated BSIs are preventable with use of evidence-based strategies.

Although the primary focus for many years has been on reducing the rate of CLABSI within intensive care units (ICU), efforts to reduce CLABSI in all healthcare settings should be encouraged. Since 2011 the Centers for Medicare and Medicaid Services (CMS) has required hospitals to report CLABSI acquired in their intensive care units (ICU) and since 2008 CMS has reduced Medicare payments to hospitals based upon their CLABSI rates. State-specific data are available for free at: www.cdc.gov/hai/surveillance/progress-report/index.html. Despite the many efforts over the past 15 years, according to CDC, annually there are still over 30,000 CLABSI in intensive care units (ICU) and acute care facilities. Although known to occur in other healthcare settings (e.g., skilled nursing facilities), the prevalence of CLABSI is not currently tracked and has not been estimated.

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According to the most recent data (2014 data, published in 2016) in the *National and State Healthcare-Associated Infections Progress Report* from the CDC, there has been a:

- 50% decrease in CLABSI between 2008 and 2014 in acute care hospitals (ACH)
- 9% decrease in CLABSI between 2013 and 2014 in long-term acute care hospitals (LTACH).

Causes of CLABSI

Risk factors for CLABSI include: greater number of lumens, increasing age, history of prior CLABSI, cancer and chemotherapy, use of corticosteroids or immunosuppressants, improper manipulation of devices, inadequate hand hygiene, and prolonged catheter use. The most common sources of catheter contamination are: migration of skin organisms at the insertion site and direct contamination of the catheter or catheter hub by contact with hands or contaminated fluids or devices. The most commonly reported pathogens for CLABSI include: *Staphylococcus epidermidis, Staphylococcus aureus*, Enterococci (i.e., *Enterococcus faecalis* and *Enterococcus faecium*), Enterobacteriaceae (e.g., *Klebsiella* spp.), *Pseudomonas* spp., and *Candida* spp.. With the exception of *Staphylococcus epidermidis*, each of these pathogens is considered an antibiotic resistant (AR) threat by the CDC. Therefore, prevention of CLABSI (in addition to the prevention of both catheter-associated urinary tract infections and surgical site infections) is recognized by the CDC as "an important strategy for reducing the impact of AR bacteria on human health, including the prevention of sepsis and death." This becomes even more important when it is recognized that although CLABSI caused by *Staphylococcus* species have decreased by 73% in recent years, at least 18% of CLABSI cases now involve one of the six "urgent" or "serious" AR bacteria listed below.

Carbapenem-resistant Enterobacteriaceae (CRE)
Methicillin-resistant *Staphylococcus aureus* (MRSA)
Extended-spectrum ß-lactamase (ESBL)-producing Enterobacteriaceae
Vancomycin-resistant *Enterococcus* (VRE)
Multidrug-resistant *Pseudomonas aeruginosa*
Multidrug-resistant *Acinetobacter baumannii*

Strategies for Preventing CLABSI

Since 2001, the Institute for Healthcare Improvement have advocated the following 5 evidence based strategies, which have been demonstrated consistently to reduce the risk of CLABSI in adults:

1. Meticulous hand hygiene (i.e., washing with soap and water or using an alcohol-based hand rub) before catheter insertion or manipulation
2. Use of maximal sterile barrier precautions during insertion (e.g., sterile gloves, sterile gown, cap, mask, and large sterile drape)
3. Use of chlorhexidine-based antiseptics (>0.5% concentration) to prepare the skin (unless otherwise contraindicated)
4. Optimal site selection (i.e., avoidance of femoral vein access)
5. Daily review of central vascular access device necessity and prompt removal of unnecessary catheters

These 5 strategies are the cornerstone of CLABSI prevention. In 2011, the Healthcare Infection Control Practices Advisory Committee (HICPAC) of the CDC, in collaboration with more than a dozen other organizations, published "Guidelines for the Prevention of Intravascular Catheter-Related Infections", which are available for free at: https://www.cdc.gov/hai/pdfs/bsi-guidelines-2011.pdf. In addition to these 5 strategies, other "best practices" or strategies that have been recommended include:

1. Educate everyone involved with the insertion, care, and maintenance of CVC about CLABSI prevention
2. Utilize the least invasive device with the smallest lumen size and fewest number of lumens possible for the individual
3. Use a catheter checklist to ensure adherence to infection prevention practices at the time of CVC insertion
4. Evaluate the catheter insertion site daily by palpation through the dressing to discern tenderness and by inspection if a transparent dressing is in use. If local tenderness or other signs of infection are observed, opaque dressings should be removed and the site inspected visually. Inform prescribers immediately if the area around a central line is sore or red.
5. Replace catheter site dressing if the dressing becomes damp, loosened, or visibly soiled
6. Disinfect catheter hubs, needleless connectors, and injection ports with every access
7. Replace administration sets at recommended intervals

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8. Prevent catheter occlusion (e.g., flushing lines in accordance with facility policies and procedures)
9. Do NOT use topical antibiotic ointments or creams on insertion sites of central venous catheters (due to risk of fungal infections and antimicrobial resistance)
10. Do NOT administer systemic antimicrobial prophylaxis routinely before insertion or during use of an intravascular catheter to prevent catheter colonization or CRBSI

Management of CLABSI

Empiric treatment of CLABSI should be based upon local prevalence of suspected organisms and available antimicrobial susceptibility data. Although culture and sensitivity data may take 2 or more days, delayed initiation of appropriate antibiotic therapy beyond 2 days has been associated with increased mortality. A summary of management recommendations for CRBSI are outlined below:

- For CVCs, the catheter tip should be cultured rather than the subcutaneous segment of the catheter.
- If there is exudate at the catheter exit site and infection is suspected, the drainage should be cultured.
- Due to the prevalence of *Staphylococcus epidermidis* and MRSA infection, vancomycin is generally recommended for empiric treatment of CLABSI
  - In healthcare settings where there is an elevated presence of MRSA, IV vancomycin (with therapeutic concentration monitoring) should be used; however, if vancomycin-intermediate *Staphylococcus aureus* (VISA) or vancomycin-resistant *Staphylococcus aureus* (VRSA) are likely, alternative agents, such as daptomycin, should be used.
  - Linezolid should be reserved until culture and sensitivity data are available
- In severe infection or in immunocompromised patients, empiric coverage for Gram-negative bacteria should also be utilized [e.g., a fourth-generation cephalosporin [i.e. cefepime], carbapenem [e.g., imipenem/cilastatin], or beta-lactam/beta-lactamase combination (e.g., piperacillin/tazobactam), with or without an aminoglycoside (e.g., gentamicin)]
- In patients with neutropenia, severe illness with sepsis, or known colonization of multi-drug resistant (MDR) organisms, empiric combination antibiotic coverage for Gram-negative bacteria (e.g., *Pseudomonas aeruginosa*) should be used
  - De-escalation should be considered once culture and sensitivity data are available
- If infection involves a femoral catheter in a critically ill patient, antibiotic selection should cover both Gram-positive and Gram-negative pathogens, in addition to treatment with an antifungal agent to cover *Candida* species.
- Empiric therapy for catheter-related Candidemia (e.g., caspofungin, micafungin) should be initiated in any patient with sepsis who also has any of the following risk factors: use of TPN, prolonged use of broad-spectrum antibiotics, hematologic malignancy, bone marrow or solid-organ transplant recipients, presence of a femoral catheter, or known colonization of *Candida* species at multiple sites.
  - Fluconazole may alternatively be used if there is very low risk of *Candida krusei* or *Candida glabrata*
- Duration of treatment depends upon the organism isolated and any signs of complication:
  - Uncomplicated CLABSI due to *Enterococcus* or Gram-negative bacteria: 7-14 days
  - CLABSI due to *Staphylococcus aureus:* 2-4 weeks
  - Complicated CLABSI with fungemia or bacteremia that persists more than 3 days after removal of an infected catheter and initiating appropriate antibiotics: 4-6 weeks

Deaths were significantly more common in cases with physical findings at the catheter insertion site, fever, tachycardia, and elevated white blood cell counts. Close monitoring and early identification of these signs and symptoms is imperative. If BSI are suspected to be due to another infection (e.g., urinary tract infection or pneumonia) and not the catheter, removal of the catheter is likely not necessary.

CLABSI and Skilled Nursing Facilities

Within CMS' current pilot program to assess infection prevention during transitions of care (refer to S&C 17-09-ALL for more details), section K of the Infection Control Worksheet (ICW) focuses exclusively on central lines and CVC. Areas of assessment for LTC in the ICW include:

- Providing evidence that "only properly trained personnel who demonstrate competence for access and maintenance of CVC are given this responsibility."
- Documentation of the insertion date and indication for a central lines/CVC
- Proper hand hygiene before and after manipulating any catheter
- Regular assessment for continued need

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Even with many success stories in the medical literature, primarily in the hospital setting, attaining a rate of zero CLABSI is a daunting challenge that requires constant awareness and a dedication to going longer and longer between infections. Success also depends upon interdisciplinary collaboration and support, ongoing education, and routine sharing of data (i.e., at monthly or quarterly meetings). According to the CDC, "Research shows that when healthcare facilities, care teams, and individual doctors and nurses, are aware of infection problems and take specific steps to prevent them, rates of some targeted HAIs (e.g., CLABSI)] can decrease by more than 70 percent." This must be remembered as efforts continue to reduce CLABSI in all sectors of healthcare, including LTC.

Additional information from the CDC is available at:
www.cdc.gov/infectioncontrol/guidelines/bsi/index.html

Medication Safety

Type 2 Diabetes Medication Increases Risk of Leg and Foot Amputations

- by Carrie Allen

The U.S. Food and Drug Administration (FDA) has mandated that the manufacturer of the type 2 diabetes medicine canagliflozin (Invokana, Invokamet, Invokamet XR) add a Boxed Warning stating that it causes an increased risk of leg and foot amputations. A Boxed Warning is the strictest warning the FDA issues, and indicates that there is reasonable evidence of a serious hazard to patients taking the medication. In this case, the evidence is based on new data from two large clinical trials, which showed that leg and foot amputations occurred about twice as often in patients treated with canagliflozin compared to patients treated with placebo. Amputations of the toe and middle of the foot were the most common; however, amputations involving the leg, below and above the knee, also occurred. Some patients had more than one amputation, some involving both limbs.

Health Care Professionals Should:

- Consider factors that may predispose patients to the need for amputations before starting canagliflozin, including:
  - a history of prior amputation
  - peripheral vascular disease
  - neuropathy
  - diabetic foot ulcers
- Monitor patients receiving canagliflozin for the signs and symptoms of infection, new pain or tenderness, sores, or ulcers involving their legs or feet, and discontinue use if these complications occur

Patients Should:

- Notify a health care professional right away if any of the following occur in their legs or feet:
  - new pain or tenderness
  - sores or ulcers
  - infections
- Talk to a health care professional if you have questions or concerns.
- Not stop taking canagliflozin-containing products without first talking to a health care professional

Both health care professionals and patients are encouraged to report side effects involving canagliflozin and other medicines to the FDA MedWatch program at https://www.accessdata.fda.gov/scripts/medwatch/index.cfm?action=reporting.home.

Selected Therapies for Neuropathic Pain

- by Kori Hauersperger

As the third leading cause of pain behind osteoarthritis and orthopedic procedures in long-term care, neuropathic pain treatment knowledge is an important part of caring for our residents. Opioids are relatively ineffective. The therapies below may assist prescribers in avoiding the use of opioids. Common causes in older residents include diabetic peripheral neuropathy (DPN) and post-herpetic neuralgia (PHN).

Intervention	Information
Treat cause(s) e.g., vitamin deficiency, tobacco/alcohol use, medication-related toxicity, hepatitis, herpes zoster, diabetes, and post-stroke pain	With evidence of deficiencies, use B-6, B-12, and vitamin E supplementation as appropriate. Tobacco use constricts peripheral vessels, damages nerves and increases pain. Folic acid reduces the risk of toxicity from methotrexate. Improving diabetic control may decrease development/worsening of DPN. Herpes zoster vaccination prevented post-herpetic neuralgia in 67%.
Nonpharmacologic interventions	Acupressure, acupuncture, massage therapy, neuroablation, and electrical stimulation (TENS)
Duloxetine (Cymbalta)	First choice by ADA to treat DPN. Common side effects are nausea, which usually resolves, and insomnia. Administer in the morning. Begin 30 mg daily for 7 days then 60 mg daily. Doses > 60 mg/day have not been shown to result in better pain control. Avoid in CrCl < 30 mL/min.
Pregabalin (Lyrica)	May be considered as an alternative if duloxetine is ineffective or not tolerated. Common side effects include mild ataxia, dizziness and sedation. Renal dosing is recommended. With normal renal function, begin 50 mg 3 times daily or 75 mg twice daily; may increase to 100 mg 3 times daily in 1 week.
Lidocaine (Lidoderm) 5% patch	Approved for PHN. Redness at application site is common. Apply up to 3 patches to cover the most painful area for up to 12 hours in a 24-hour period. Patches may be cut into smaller sizes with scissors prior to removal of the release liner.
Gabapentin (Neurontin)	Approved for PHN. Less expensive than Lyrica, adverse effects are similar: ataxia, dizziness and sedation. Begin 300 mg on day 1, then 300 mg twice daily on day 2, and then 300 mg three times daily on day 3 (renal dosing required and may permit twice daily dosing).
Tricyclic Antidepressants (TCAs) *[Not FDA-approved for neuropathy]*	Poorly tolerated in older adults. Nortriptyline and desipramine are preferred over other TCAs due to less anticholinergic effects and syncope. Dry mouth is very common. Constipation, confusion, dizziness and sedation are reported in >10%. Caution in cardiac disease, seizure disorders and persons with high fall risk. Begin with low doses in the evening and gradually increase as tolerated and appropriate. Usual maximum dose for nortriptyline or desipramine are 150 mg daily.

Drug information available at https://dailymed.nlm.nih.gov/; ADA = American Diabetes Association; CrCl = creatinine clearance; FDA = U.S. Food and Drug Administration

Tymlos™ Injection

- by Dave Pregizer

Brand Name (Generic Name)	**Tymlos (abaloparatide)**
How Supplied	3120 mcg/1.56 mL (2000 mcg/mL) in a single-patient-use prefilled pen. The prefilled pen delivers 30 doses of 80 mcg abaloparatide
Therapeutic Class	Human parathyroid hormone related peptide [PTHrP(1-34)] analog
Approved Indication	Treatment of postmenopausal women with osteoporosis at high risk for fracture
Usual Dosing	80 mcg subcutaneously once daily. Inject into the periumbilical region of abdomen. Supplemental calcium and vitamin D is recommended if dietary intake is inadequate.
Select Drug Interactions	Studies show abaloparatide does not inhibit or induce Cytochrome P450 enzymes at therapeutic concentrations.
Most Common Side Effects	Hypercalciuria, dizziness, nausea, headache, palpitations, fatigue, upper abdominal pain, and vertigo
Miscellaneous	Boxed Warning for osteosarcoma risk. Patients should sit or lie down if symptoms of orthostatic hypotension occur after administration.
Website	http://tymlos.com

NEW Generic Medications

Generic Name	Brand Name	Date Generic Available
Ezetimibe/Simvastatin 10 mg/10 mg, 10 mg/20 mg, 10 mg/40 mg, and 10 mg/80 mg Tablets	Vytorin® Tablet	4/27/17
Tazarotene 0.1% Cream	Tazorac® Cream	4/17/17

HealthLine Quiz

– by Steve Law

1. **Which statement is FALSE about central-line assocated bloodstream infections (CLABSI)?**
   a. These infections may increase the length of stay in ICU by 13 days
   b. Patients with a CLABSI have been found to be 1.7 times more likely to experience a 30 day hospital readmission
   c. A risk factor for a CLABSI is use of corticosteroids or immunosuppressants
   d. A commonly reported pathogen for CLABSI is *Escherichia coli* (E. coli)

2. **Which is a strategy for preventing CLABSI?**
   a. Meticulous hand hygiene
   b. Use of maximal sterile barrier precautions during insertion
   c. Use of chlorhexidine-based antiseptics
   d. Daily review of central line necessity and prompt removal of uncessary lines
   e. All of the above

3. **Linezolid is a first line antibiotic for a CLABSI:**
   a. True b. False

4. **According to the FDA, patients receiving canagliflozin-containing products (e.g., Invokana) should be monitored for:**
   a. New pain or tenderness in the feet or legs
   b. Sores or ulcers on the feet or legs
   c. Signs and symptoms of foot infection
   d. All of the above

5. **Which statement is TRUE about the treatment of neuropathic pain?**
   a. Tricyclic antidepressants are FDA approved for neuropathic pain
   b. Opiods are the most effective pain therapy for neuropathic pain
   c. Gabapentin should be renally dosed
   d. Vitamin D deficiency can be a cause

6. **Which statement is FALSE about the new medication Tymlos™ (abaloparatide)?**
   a. It is a human parathyroid hormone related peptide
   b. It is used for the treatment of postmenopausal women with osteoporosis at high risk for fracture
   c. Calcium and Vitamin D is recommended
   d. It is dosed 80 mcg subcutaneously every week

***Please note, the HealthLine Quiz is designed to help readers retain information that is relevant to their care setting. It is not an approved source of continuing education credits for healthcare professionals.**

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Answers to the HealthLine Quiz: 1) D 2) E 3) B 4) D 5) C 6) D