Impact of Novel Technologies in the Prevention of Catheter-Related Bloodstream Infections

Thursday, April 7
7:00-8:45 a.m.
Hilton Orlando—
Orange Ballroom FG

Supported by an unrestricted educational grant from CareFusion, Covidien, and Excelsior Medical

A Symposium Held in Conjunction with the 2011 NHIA Annual Conference & Exposition

NHIA 20th Annual Conference & Exposition
SHAPING OUR HORIZON
Impact of Novel Technologies in the Prevention of Catheter-Related Bloodstream Infections

Thursday, April 7, 7:00 to 8:45 a.m.

05-S. Impact of Novel Technologies in the Prevention of Catheter-Related Bloodstream Infections
Hilton Orlando – Orange Ballroom FG
Pharmacist, Pharmacy Technician and Nurse Continuing Education Contact Hours: 1.5
ACPE Pharmacist and Pharmacy Technician Program #: 207-999-11-231-L01-P&T
Knowledge-Based Learning Activity

Education Overview:
Catheter-related bloodstream infections (CRBSI) are a risk wherever an indwelling catheter is used, be that in the hospital or the home infusion setting. Primary differences between these two sites of care touch on who is utilizing the catheter to administer therapy, and who is monitoring the catheter for complications every day that it remains in place. For hospitalized patients, the “who” is a trained nurse, and for the home infusion patient, it is most often the patients themselves, and/or lay caregivers. Clinicians in the home infusion setting are called to carefully weigh the available evidence and make the best product and patient-education decisions possible in order to minimize the possibility of a CRBSI in the home. With few studies conducted in the home setting to assist home infusion clinicians in their decision making, education is essential to bridge the gap and provide them with the tools they need to achieve the most effective care possible.

This session will address the evidence regarding use of a variety of novel technologies in the care and maintenance of vascular access devices (VADs). From skin-based antiseptics to injection-port disinfectants, and from impregnated catheter materials to injection ports and dressing materials, the panel will address the body of evidence that is available to inform decision making and effective nurse and patient education. The goal of this session is to provide a baseline of evidence that will support home infusion providers in making informed decisions about the use of novel technologies in catheter care, as well as to encourage more consistent tracking and reporting of catheter outcomes in this setting.

Faculty: Debbie Cain, RN, CRNI®, Vice President, Home Parenteral Services, Cox Health, Springfield, MO; Melissa Leone, RN, BSN, Director of Nursing Operations, Coram Specialty Infusion, An Apria Company, Hamden, CT; Nita Meaux, RN, CRNI®, Director of Risk Management, Heart Failure Program Director, Walgreens Infusion and Respiratory Services, Montgomery, TX; Kevin L. Ross, RN, BSN, Nurse Consultant, Bartonsville, TX; and Felicia Schaps, RN, CRNI®, OCN, CNSC, Clinical Resource Nurse, HomeChoice Partners, Inc. – A DaVita Company, Annandale, VA

Debbie Cain, RN, CRNI® is the Vice President of Operations and Director of Nursing for Home Parenteral Services in Springfield, Missouri. She has worked in the home infusion industry for the past 22 years. She has extensive experience providing continuing education, and has presented to audiences on a local, state, regional, and national level on a wide variety of topics, including implementation of home care and hospital-based PICC programs as well as vascular access device care in the home. She served two terms on the NHIA Board of Directors in the role of Secretary, as well as roles on the NHIA Membership, Standards and Education Committees. In 2010 Debbie received the Gene Graves Lifetime Achievement Award, presented by the NHIA Board of Directors to an individual who has worked tirelessly to advance the field of home infusion.

Melissa Leone, RN, BSN, is currently the Director of Nursing Operations for Coram Infusion Services, an Apria Healthcare Company. She has been working in the home infusion industry for over 19 years now, and has helped develop a variety of staffing models during this time. Her experience in a series of nursing and operational management roles has helped her refine an understanding of the activities that truly define a day in the life of a home infusion nurse. Melissa has previously spoken nationally at NHIA on the topics of patient and referral source satisfaction, disease management programs, handling hazardous pharmaceuticals and nurse zoning. She has also spoken nationally at the Infusion Nurses Society (INS) on the subjects of patient satisfaction and catheter outcomes in home infusion, the latter of which she also published in the Journal of Infusion Nursing in March 2008. Melissa has volunteered her time on the NHIA Education Committee, serving in her fourth year as Chair.
Impact of Novel Technologies in the Prevention of Catheter-Related Bloodstream Infections

Nita Meaux, RN, CRNI®, is the Director of Risk Management and the Heart Failure Program for Walgreens-OptionCare. She has 30 years nursing experience with 18 years experience in all aspects of home infusion as a field nurse, Nurse Manager, General Manager, and Regional Manager for both operations and clinical services. Nita has training and experience as a Legal Nurse Consultant. As Director of Risk Management, Nita works closely with the field offices to evaluate, assess, and manage risks associated with increasingly challenging patients and therapies. She oversees the quality assurance reporting system, identifying and evaluating trends in an effort to maximize the provision of safe and appropriate patient care while managing costs of service and reducing risks to patients, employees, and the corporation. At Walgreens-OptionCare, Nita developed and implemented a comprehensive program for heart failure patients receiving inotropic infusion therapy at home. The program includes patient and staff education as well as outcomes monitoring. Four years of data are evidence of excellent outcomes, as well as increased revenue and reimbursement. Nita lives in Texas but is President of the Illinois Chapter of INS. She also served on the INS Jugular Cannulation Task Force and is part of the INS network. She has served two years on the national meeting committee for the American Association of Heart Failure Nurses and is in her third volunteer year on the Education Committee for NHIA.

Kevin Ross, RN, BSN, has more than 28 years experience in the home infusion industry. He served the past 10 years as National Director of Nursing Services for a National home infusion provider. His experiences include policy and procedure development, clinical drug administration protocols, staff education, performance improvement and clinical outcome analysis. In addition, he served for more than 10 years as a Surveyor in the Home Care and Hospice program for the Joint Commission. Kevin has authored several articles and has presented at numerous clinical meetings for NHIA, American Society of Health-System Pharmacists (ASHP) and INS, covering topics including care planning, disaster management, and clinical outcomes. Kevin received his BS in Nursing from Texas Woman's University in Denton, TX. He is active in several professional organizations including INS, AVA, ASHP and NHIA where he has served on the Education Committee for the past three years.

Felicia Schaps, RN, CRNI®, OCN, CNSC, has been an RN for 26 years, 20 of which have been in home infusion. She has held a variety of nursing roles in that time, beginning as a Field Nurse, and advancing to Nurse Manager, then Branch Manager. Felicia is currently a Clinical Resource Nurse for HomeChoice Partners, a regional home infusion provider, where she provides education and support to clinical staff at a number of Branch offices. She is responsible for internal and external education programs on a wide range of home infusion topics, including VAD care and maintenance and management of oncology patients in the home. She was a member of the Speakers Bureau for OptionCare, and has provided education programs at local INS conferences. Felicia holds an infusion CRNI® certification from the INCC, an oncology OCN certification from the Oncology Nurses Society (ONS), and a nutrition CNSC certification from the American Society of Parenteral and Enteral Nutrition (ASPEN). She has been actively involved in NHIA for a number of years and has recently rejoined the NHIA Education Committee.

Pharmacist and Nurse Education Objectives:
1. Examine trends in catheter-related bloodstream infection (CRBSI) rates in hospital vs. home infusion data.
2. List clinical outcomes associated with specific catheter flush solution options.
3. Describe the efficacy of three types of skin antisepsis products.
4. Describe options for external catheter care and the clinical outcomes associated with each.
5. Describe novel technologies designed to reduce the risk of catheter colonization and subsequent infection.

Pharmacy Technician Education Objectives:
1. Examine trends in catheter-related bloodstream infection (CRBSI) rates in hospital vs. home infusion data.
2. List clinical outcomes associated with specific catheter flush solution options.
3. Describe the efficacy of three types of skin antisepsis products.
4. Describe options for external catheter care and the clinical outcomes associated with each.
5. Describe novel technologies designed to reduce the risk of catheter colonization and subsequent infection.
Learning Assessment Questions:

1. Which of the following trends in CLABSI occurrence since 2001 reflects the impact of a coordinated effort to implement best practice guidelines for central line care in the ICU setting?
   a. A reduction in the rate of CLABSI occurrence in ICUs by 58%
   b. A decrease in CLABSIs caused by staphylococcus aureus is attributed to scrub the hub campaigns
   c. The majority of CLABSIs are now occurring outside of the ICU
   d. A and C

2. Transparent dressings are more effective at preventing CLABSI than gauze dressings.
   a. True
   b. False

3. Catheter pistoning refers to which of the following:
   a. Movement of the catheter tip within the superior vena cava
   b. Gradual movement of the catheter out of the vein until it must be removed and replaced
   c. Movement of the catheter in and out at the skin level due to inadequate securement
   d. None of the above

4. An antiseptic patch or dressing should be considered for central venous access devices (CVAD) that demonstrate a higher than average rate of CLABSI due to skin-based microrganisms such as staphylococcus aureus.
   a. True
   b. False

5. A lifetime parenteral nutrition patient has just received her third tunneled CVAD, with the prior two removed following enterococcus spp. sepsis. This patient could benefit from an antiseptic cap to minimize contamination through the catheter hub.
   a. True
   b. False

6. When completing instillation of the final flush solution, which sequence below for clamping the catheter and disconnecting the final flush syringe is correct?
   a. Positive pressure cap: always clamp the catheter first, then disconnect the syringe
   b. Positive pressure cap: always disconnect the syringe before clamping the catheter
   c. Negative pressure cap: always disconnect the syringe before clamping the catheter
   d. Neutral pressure cap: always disconnect the syringe before clamping the catheter

7. Always follow a 70% ethanol CVAD instillation with a saline flush before locking the catheter with heparin, due to an incompatibility between ethanol and heparin.
   a. True
   b. False

8. Antibiotic lock therapy has demonstrated efficacy with which of the following drugs:
   a. Vancomycin
   b. Cefazolin
   c. Ampicillin
   d. All of the above

Answers can be found on the last page of this booklet.
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Top 5 Things to Know for CE:
- Make sure your BADGE IS SCANNED each time you enter a session, to record your attendance.
- Carry the Evaluation Packet you received on registration with you to EVERY session. If you're not applying for CE, we still want to hear from you! Your opinions about our conference are very valuable.
- Pharmacists, Pharmacy Technicians and Nurses need to track their hours on the Statement of Continuing Education Certificate form as they go.
- FOR CE: At your last session, total the hours and sign both pages of your Statement of Continuing Education Certificate form.
  ✓ Keep the PINK copies for your records.
  ✓ Place the "YELLO" and "WHITE" copies in your Evaluation packet.
  ✓ Make sure an evaluation form from each session you attended is completed and in your Evaluation packet (if you forget to pick up an evaluation form of a session, extras are available in an accordion file near the registration desk.)
  ✓ Put your name and unique member # number (six digit number on the bottom of your badge on the outside of the packet, vest it, and drop it in the drop boxes in the NHIA registration area at the convention center.)

Disclosures
The panel speakers declare no conflicts of interest or financial interest in any service or product mentioned in this program.
Clinical trials and off-label use will not be discussed.
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Introduction
Nita Meaux RN, CRNI®

Clinical Practice Guidelines
Commonly defined as "systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances." ¹

Considerations in Evaluating Evidence Based Guidelines ²
- Literary review: clinical trials, meta-analysis, outcomes
- Evaluate strength of evidence (for or against a treatment or procedure)
- Consider current outcomes data in estimating expected future outcomes
- Avoid any actual, potential or perceived conflicts of interest
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Evaluate the Evidence

- Consider the strength of the level of evidence and research supporting guidelines or standards
  - Meta-analyses
  - Systematic literature reviews
  - Guidelines based on randomized controlled trials
  - Clinical articles
  - Consensus reports
  - Generally accepted practice

Applicability of the Evidence

- Practice setting
  - Acute care vs. home care
- Patient population
- Type of vascular access device
- Length and type of therapy
- Caregiver
- Data collection methods

Implementing Best Practice

- Consider
  - Guidelines
  - Standards
  - Regulations
  - Current practice and outcomes
  - National statistics and outcomes
- Monitor outcomes
  - Change in protocol, supplies or equipment, patient population
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Preventing CLABSI

- From CR-BSI to CLABSI—are we making progress reducing catheter infections?
- Diagnosing CLABSI (differential time to positivity, new INS standard to replace cap-draw blood [no discard]-flush until clear)
- Where’s the Evidence?
  - Acute care, usually ICU settings
  - Applying research to the alternate site of care
  - Differences in environment, caregiver, activity levels
- What do home infusion outcomes data tell us about our best practices? What does your data show?

A Focus on Central Line Associated Bloodstream Infections (CLABSI)

- CLABSI rates in ICUs have fallen by 58% in the past 10 years
  - 43,000 in 2001 to 18,000 in 2009
- Reductions in CLABSIs caused by Staphylococcus aureus were more marked than reductions in infections caused by gram-negative rods, Candida spp., and Enterococcus spp.

What the Pathogen Prevalence Tells Us

- S. aureus more commonly inhabits the skin
  - Likely a more common cause of insertion-related infections
  - Good antiseptic practices on insertion = reduced rates of skin as the source of CLABSI
- Gram-negative rods, Candida spp., and Enterococcus spp more likely to be introduced into the catheter via the hub
  - Suggests a need for improved implementation of post-insertion line-maintenance practices
CLABSIs Beyond the ICU

• In 2009, an estimated 23,000 CLABSIs occurred among patients in inpatient wards
  – Reflects a CLABSI rate of 1.14 infections per 1,000 central line-days for inpatient wards
  – How many of these are home infusion patients admitted with a CLABSI that isn’t documented in the home infusion provider’s outcomes?

• In 2008, an estimated 37,000 CLABSIs occurred among patients receiving outpatient hemodialysis
  – Reflects a CLABSI rate of 1.05 infections per 1,000 central-line days for outpatient hemodialysis

Sources of CLABSI

Preventing CLABSI With Skin As the Source

• Dressings
• Securement
• Skin Antisepsis
• Anti-microbial patch dressings
Antimicrobial Transparent Dressings and Securement Devices

Felicia Schaps RN, CRNI®, OCN, CNSC

Catheter Dressings

• Transparent (q 7 days) vs. Gauze (q 48 hrs)
  – Which prevents more infections?
  – Evidence:
    • Gilles, et al: Dressing type (gauze vs. transparent) had no effect on rates of CR-BSI
• Implications of dressing choice in the home
  – Level of protection
  – Change frequency = nurse visit frequency
  – Exit site visibility: how important is this beneath an antimicrobial dressing?

Antimicrobial Transparent Dressings

• 3M Tegaderm® CHG “patch” centered over exit site
  – Site remains visible for assessment while dressing in place
• How it works:
  – Releases CHG into the skin around exit site, creating a zone of inhibition promoting antimicrobial growth
• Application: same as any transparent dressing
• Removal: alcohol prep pads/swabsticks or sterile saline/gauze may be needed

CONSIDERATIONS:

- Test gel pad for fluid absorption (gently press on dressing; incontinence remains = bag is saturated)
- Change when saturated
- Removal:
  - sterile prep pads or swabsticks (the wetter the better)
  - 1/3rd of sterile saline and gauze
Catheter Securement

- Securement prevents "pistoning" of catheter

  Movement of the catheter in and out of the exit site can carry microorganisms into the site

  Microorganisms can migrate along the outside of the catheter, into the bloodstream.

Securement Dressings and Devices

- Evidence is limited, acute-care based
- Impact of patient activity level, climate, skin tolerance to adhesives
- What device design works best?

Securement Transparent Dressings

- 3M Tegaderm® IV Advanced Securement Dressing
- Centurion SorbaView Shield®
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Securement Devices
- Available in a wide range of styles and configurations
- Universal and PICC-specific
- Follow each product’s Instructions For Use (IFU)
- Change securement devices at least once per week, or with each transparent dressing change

Antimicrobial Patches and Injection Cap Antisepsis
Novel Catheter Technology
Melissa Leone, RN, BSN

Novel Antimicrobial/Antiseptic Products
- Antiseptic-impregnated patches or discs
- Injection cap antisepsis
  - Alternative options
- Items not always indicated
  - Desire to achieve improved catheter outcomes or infection rates
  - Patients at higher risk for contracting a catheter infection
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Available Antimicrobial Discs or Patches

- Biopatch®
  - CHG impregnated
- GuardIVa®
  - CHG and hemostatic agent
- AMD® Foam Disc
  - Polyhexamethylene biguanide hydrochloride (PHMB) impregnated
- Silverlon®, SilvaSorb®, ActiCoat® Site
  - Silver coated

When to Use an Antiseptic Disc or Patch

- Catheter infection rates higher than peer settings
- Immunocompromised patient
- High risk catheter type or patient care setting
  - Multi-lumen catheters
  - Intensive Care Unit
- MUST demonstrate improved outcomes
  - Do not bow to pressure if improved outcomes are not demonstrated in YOUR setting.

Novel Injection Cap Disinfection

- Disinfection Caps
  - SwabCap®
  - Curos®
- Site Scrub®
  - Indicated when non-compliance with injection cap disinfection is suspected or catheter infection rates are in need of improvement.
Disinfection Caps

- SwabCap®
  - Cap containing sterile 70% IPA
  - Luers onto mechanical valve between accesses
- Curos®
  - Cap containing 70% IPA
  - Luers onto mechanical valve between accesses

Site-Scrub®

- For use with disinfecting an injection cap or catheter opening
- “Fingers” allow catheter entry to remove debris between injection cap changes

Home Infusion Practices

- Frequently driven by hospital-based research
  - Catheter types that we do not use
  - Catheter infection rates not equivalent to our setting
- Ensure that any novel technology demonstrates improved outcomes in YOUR setting***
  
  Share data with your peers
Preventing Intraluminal Sources of CLABSI

• Injection Caps - how well are they guarding the door?
• Flush Solutions
  – Heparin Locks
  – Antibiotic Locks

Needleless Injection Caps/Connectors

Debbie Cain RN, CRNI

Needleless Connectors

• Standards / Guidelines
  – CDC
  – INS
  – SHEA Compendium
  – FDA Letter to ICP
• http://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/ucm220459.htm
• Evidence Based Practice
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Types of Connectors

• Positive Displacement
  – flush / clamp / disconnect order
• Neutral Displacement
  – flush / clamp / disconnect order
• Negative Displacement
  – flush / clamp / disconnect order

New Products

• Anti-microbial Needleless Connectors
  – Hospira
  – Baxter
  – RyMed Technologies
  – Carefusion

Practice Criteria Needleless Connectors

• "Scrub the Hub"
  – catheter hub is known source of CR-BSI
• Frequency of Change
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VAD Technology

- Valved Catheters
  - saline vs heparin flush
- Power Catheters
  - care and maintenance
- Antimicrobial Coated Catheters
  - hospital vs home care

Flush Solutions

Kevin Ross RN, BSN

Biofilm

- A collection of cells that are attached to the catheter and each other
- Microorganisms embedded in a matrix of extracellular polymeric material
- Colonize indwelling catheters and medical devices
  - Biofilm forms within minutes of catheter placement
- May be resistant to antimicrobial agents
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Biofilm Stages

- Attachment
  - Planktonic (free floating) bacteria adheres to surface
- Growth
  - Secretes substance causing organisms to adhere and grow on the surface
- Detachment
  - Biofilm detaches and floats into bloodstream

Three Stages of Biofilm Development

Ethanol Lock Therapy (ELT)

- Filling catheter lumen with medical grade sterile ethyl alcohol
- Allow ethanol lock solution to dwell for prescribed length of time
- Aspirate or flush ethanol lock solution through catheter as prescribed
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Ethanol Lock Therapy
what we know

• Ethanol lock therapy is a safe and effective means of reducing CVC infection rates in parenteral nutrition dependent children
  – 70% ethanol
  – Dwell for minimum of four hours


Ethanol Lock Therapy (ELT)

• Involves sterilization of the intraluminal space (inside the catheter)
• Ethanol is bactericidal
• Ethanol lock has been used to help keep long term TPN catheters infection-free

  From Opilla et al. JPEN July-Aug 2007

ELT Considerations

• Use only medical grade sterile ethyl alcohol to prepare ELT
• Ethanol is NOT compatible with heparin and citrate
  – Always clear a catheter by flushing with normal saline before and after ELT
ELT Considerations

- Ethanol may cause degradation of certain plastics and catheter materials
- Always verify with the manufacturer that the material in the specific brand of intravascular device will not be harmed by the presence of ethanol for extended dwell times.
- Studies have shown that 70% ethanol does not appear to alter the properties of polyurethane or silicone catheters


Obtaining Orders for ELT

- Orders should specify:
  - Final concentration of ELT solution
  - Volume to be infused into each lumen
  - Dwell time for ELT solution
  - Aspirate or flush through catheter
  - Duration of ELT therapy
  - Additional flush procedures between ELT therapy

Antibiotic Lock Therapy (ABL)

- Filling catheter lumen with pharmacologic concentrations of anti-infective agent
- Allow anti-infective agent to dwell for prescribed length of time
- Aspirate or flush anti-infective through catheter as prescribed
2011 INS Standard of Practice 45

• Practice criteria (W)
  – ABL may be used for salvage of infected long term CVAD
  – Vancomycin, ceftazidime, cefazolin, ciprofloxacin, gentamicin, and ampicillin have been studied
  – Dwell time depends on the need to use the catheter and clinical response
  – Use of ABL is not recommended as a routine prophylactic measure due to development of resistant micro-organisms

2011 INS Standard of Practice 45

• Prophylactic use may be considered if patient has history of catheter related bloodstream infections or with other risk factors such as prosthetic heart valve.

ABL Considerations

• Identify the organism’s sensitivity
• Verifying stability of the specific ABL solution and concentration
• Compatibility of ABL solution with heparin
  – Flush with saline if ABL solution is not compatible with heparin
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Obtaining Orders for ABL

- Orders should specify:
  - Anti-infective agent alone or mixed with (heparin flush solution) to be used
  - Final concentration of ABL solution
  - Volume to be infused into each lumen
  - Dwell time for ABL solution

Obtaining Orders for ABL

- Orders should specify:
  - Aspirate or flush through catheter
  - Duration of ABL therapy
  - Additional flush procedures between ABL therapies

Panel Question and Answer Session
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Answers:
1. D
2. B
3. C
4. A
5. A
6. B
7. A
8. D
SHAPING OUR HORIZON

Maximizing 20 Years of Achievement to Craft a Future of Possibilities