Omnicare
Pharmacy Services

Strategies to Prevent Catheter Related Blood Stream Infections

A self-study educational program presented by Omnicare Infusion Services

Intended Audience Licensed Nurses

Educational Methodology 1 Hour Self-Study Learning Module

Directions for Completion of Self Learning Module

Step 1: Read Learner Objectives

Step 2: Read the following

- Article "The Role of the LTC Nurse in Infusion Therapies: Strategies to Prevent Bloodstream Infections"
- Infusion Notes
  - Strategies for the Prevention of Catheter Related Bloodstream Infections
  - No "Looping"
  - IV Administration Sets
  - Clean vs Aseptic vs Sterile
- Appendix
  - Infusion Maintenance Table, Appendix A.1

Learner Objectives

- Define the elements of The Joint Commission's National Patient Safety Goal (NSPG.07.04.01)[1] and its impact for nursing care of residents admitted with intravenous catheters in the LTC setting
- Define the incidence of infection associated with vascular access devices and how breaches in infection control standards place the resident at risk
- Describe nursing interventions that minimize potential for infection-related complications and improve resident outcomes utilizing recommendations from the Centers for Disease Control (CDC), SHEA (Society for Healthcare Epidemiology of America), and The Joint Commission (TJC)

The Role of the LTC Nurse in Infusion Therapies:

Strategies to Prevent Bloodstream Infections

In an issue of Infection Control Resource, Lynn Hadaway stated, "most modern day LTC healthcare facilities recognize the need for the use of intravascular catheters in their patient population for the treatment of dehydration, antimicrobial and pain therapies" (3). The impact of early discharge from acute care centers into long-term care facilities has made it imperative to educate nurses in various types of vascular access devices usually managed by IV teams in the hospital.

On any given day, a LTC facility may admit residents from multiple acute care centers. Each acute care center may use various types of vascular access devices. Knowledge of the differences and similarities among catheter designs and current flush protocols pose many questions for the LTC nurse. Therefore, the nurse must increase awareness of the potential for infectious complications that may begin with a breach in infection control or a sequence of consequences associated with catheter occlusions that lead to catheter related bloodstream infections.

The requirement of The Joint Commission (TJC) National Patient Safety Goal (NSPG.07.04.01) is for healthcare facilities to put into practice, "an evidence-based program that pro-actively prevents central line-associated bloodstream infections" (7). The goal covers short and long-term central vascular access devices (CVADs).

TJC states, "All healthcare facilities, licensed nurses and healthcare practitioners involved in managing patients with central line catheters, be educated and prepared for assessment, monitoring and documentation responsibilities" (7). The potential risk factors associated with CVADs have made it necessary to provide a comprehensive educational program to be in place in all LTC facilities.

Genetec (2008) explains very clearly that, "1 out of every 4 central venous catheters becomes occluded" (1). Ryder (2006) discovered, "87% of bloodstream infections are associated with the presence some type of intravascular device" (6). Other studies have discussed organisms that grow and multiply after they attach on the catheter internal and external surfaces. These organisms include S. aureus, S. epidermidis, Pseudomonas aeruginosa, Enterococcus faecalis and C. albicans.

Recognition of the relationship between catheter occlusion and bloodstream infection is important for the nurse to understand secondary to the evidence that catheter occlusions may lead to catheter related bloodstream infections. It is important that nurses administering infusion therapies be reminded of strict adherence to flushing protocols to avoid such complications.

Prevention of blood reflux back into the catheter lumen ultimately reduced the potential of infection. Blood is a medium for bacterial growth and if any blood remains stagnant in the lumen of the catheter there is an increased probability of bacterial growth.

In addition to catheter related bloodstream infections, CVADs pose an additional risk for localized skin infections. Therefore, vigilant assessment of catheter site and surrounding tissue is essential to preventing negative outcomes for the resident. Site assessment for signs of infection must include direct observation for redness or erythema, induration, a palpable venous cord, and purulent drainage. One of all of these symptoms

may be exhibited individually or concurrently. Frequent and direct observation is essential for early identification and prevention of catheter-related localized skin and bloodstream infections that may lead to sepsis.

The Genentech monograph discusses a proactive catheter management strategy recommended by the Center for Disease Control and Prevention and the American Academy of Pediatrics. Genentech (2008) advised against, "the routine replacement of catheters as a strategy to prevent infections" (1). Genentech also states, "There is no evidence that catheter replacement lowered infection rates" and explains the "merits of catheter salvage versus replacement" (1). Occluded catheters may be salvaged by using thrombolytic agents to restore patency. The use of thrombolytic agents to restore catheter patency in the LTC setting is performed by specially educated nursing staff, nurse practitioners or infusion specialists.

The 2013 Joint Commission's proactive strategy includes early and routine assessment of all patients' central venous catheters with a recommendation to remove "nonessential catheters". A non-essential infusion catheter is a catheter which dwells inside the venous anatomy and is not being utilized for the delivery of intravenous medications or solutions now or will not be used in the immediate future (7 days or less). An exception is made for surgically placed long-term catheters. These catheters would include an implanted ort or tunneled/cuffed catheters placed specifically for anticipated needs secondary to a resident's chronic medical condition.

An additional concern for nurses managing residents with intravascular catheters is the formation of biofilm and its relation to infection. Biofilm can be described as collections of microorganisms surrounded by the slime they secrete. Biofilm attaches to either living or inert surfaces. You are already familiar with some types of biofilm: the plaque on your teeth, the slippery slime on river stores, and the gel-like film on the inside of a vase which held flowers for a week. This sticky matrix may be what the nurse first encounters when reporting that the resident's catheter is difficult to aspirate and flush (sluggish). When biofilm is present there is always a risk that microorganisms can detach and cause infection.

The body's internal coagulation pathway also plays a part in the formation of fibrin that attaches to the catheter surface. This pathway is triggered when the blood is exposed to a foreign object such as the CVAD.
The body recognizes the foreign object inside the vascular system and sends out special factors that continue to accelerate and produce fibrin, a protein that entangles platelets and forms a clot.

The adherence of biofilm and fibrin on the catheter causes an uneven surface surrounding the distal end of the catheter, making it difficult, if not impossible, for the nurses to aspirate or flush the catheter without meeting resistance. These two events reinforce the need to remind nurses to strictly adhere to appropriate flushing schedules. Further studies are currently being conducted to develop an ideal flushing agent that will dissolve this sticky matrix to prevent it from clumping or dislodging. Currently this material may clump or dislodge, thereby increasing the potential for CRBSI, dangerous clots, or microscopic emboli.

Nurse Advise-ERR discusses infection control standards and cites evidence indicating, "nurses have failed to place sterile end caps on administration sets following intermittent administration of medications" (2). There is additional evidence that nurses have failed to adequately disinfect IV needleless connectors prior to administering medication. The nurse who places the end of the administration set into the Y-site on the set is violating safe practice standards. This breach of infection control standards is termed "looping." The upper Y-site is exposed to ambient air and potential contaminants. The practice of looping is not permitted due to the potential for introducing the contaminants into the administration set. The failure to place a sterile cap at the end of a re-useable IV administration set and the failure to properly disinfect the needleless connector places the resident at risk for infection and may contribute to an increase in bloodstream infections.

Nurses must observe and adhere to infection control standards. It is mandatory that the needleless connector is vigorously scrubbed with an antiseptic before each access. A new sterile end-cap must be placed on the end of the IV administration set between each delivery of medication. In addition, the intermittent administration set is to be changed every 24 hours. Proactive nursing interventions, such as these, ensure resident safety, support infection control standards, and prevent multiplication of microorganisms.

A growing concern in today's healthcare setting is the lack of knowledge and understanding of the various catheter technologies used to deliver infusion therapies. Keeping abreast of the ever-changing and improving catheter technology may present various challenges to the LTC nurse. Typically a LTC facility accepts residents from various acute care institutions. The accepting LTC nurse must be able to recognize the difference in each vascular access devices (VADs) they encounter. It is imperative that appropriate information regarding the VAD is exchanged during the reporting process from the hospital into the LTC setting and nurse-to nurse during shift changes.

A systematic approach to the reporting process needs to be institution wide regardless of the setting. This means an organized approach that includes the caregiver' knowledge of the type of VAD, its location, its technology, the number of lumens, and the flushing protocols required for the catheter.

The Infusion Nurses Society Standards state, "There are two purposes for flushing an intravenous catheter. One is to maintain catheter patency and the second is to prevent contact between two or more incompatible medications or solutions" (4). In addition, accurate and early diagnosis of catheter occlusion is paramount to understanding the management of catheter-related, local, and systemic blood stream infections.

Ryder (2005) explains, "The conceptual module of catheter-related bloodstream infections, started by microorganisms that form biofilm, and then expand into a sticky matrix, is important for nurses to learn in order to change nursing practices that could potentially injure the patient" (6).

Although various protocols for flushing agents are widely observed, good infection control practices are driven by evidenced-based standards. Omnicare catheter management guidelines and recommendations for preventing CRBSIs will always include appropriate skin prep procedures using an antiseptic agent and vigorous cleansing of the needleless connector before each connection. Competency evaluations that include monitoring for adherence to infection control standards should be included as a part of every LTC infusion program.

In summary, in order to promote safe care, nurse must be informed and educated when new technologies and therapies are developed. The resident receiving infusion therapy requires competent nursing personnel who consistently practice with one goal in mind: providing safe and timely nursing interventions that maintain strict adherence to infection control standards.

Omnicare
Pharmacy Services

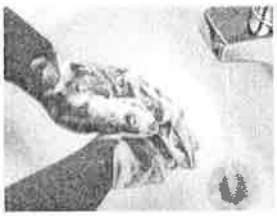
CR-BSIs

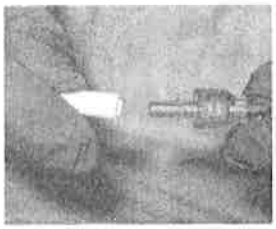
Prevention of Catheter Related Bloodstream Infections

The Facts

- 250,000 CR-BSIs (Catheter Related Bloodstream Infections) are diagnosed each year in the US
- CR-BSIs cost $6.25 billion per year
- Mortality is 14,000 – 28,000 annually
- Central vascular access device associated bloodstream infections alone cost $2.3 billion annually
- The cost of treating CR-BSIs has been found to vary from $3700 - $29,000 per episode

CR-BSI Prevention Check List



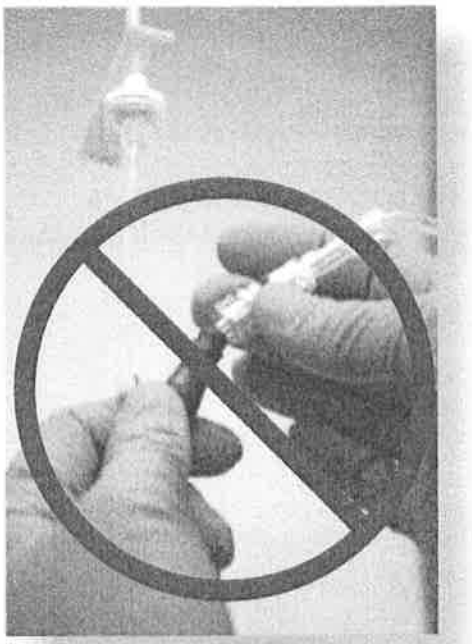


- ❑ Perform hand hygiene before insertion or manipulation of any catheter device
- ❑ Maintain asepsis at all times when handling vascular access devices
- ❑ ***Vigorously*** scrub catheter hubs, injection ports and needleless connectors with antiseptic before accessing
- ❑ Always cover end of intermittent administration set with sterile tip cap between infusions
- ❑ Change administration sets every 96 hours for continuous infusions and every 24 hours for intermittent infusions
- ❑ Change transparent dressings every 7 days or more frequently if dressing is soiled loose or damp. Change gauze dressings every 48 hours or more frequently if dressing is soiled loose or damp
- ❑ Disinfect skin with a 2% Chlorhexidine-based antiseptic during dressing changes
- ❑ Do not use topical antibiotic ointment or creams on insertion sites (except when using dialysis catheters)
- ❑ Do not submerge the catheter under water; showers are permitted if the catheter and connected device are protected with an impermeable cover
- ❑ Review IV catheter necessity daily with prompt removal of unnecessary lines
- ❑ Replace peripheral venous catheters every 96 hours in adults to prevent phlebitis and infiltration
- ❑ When adherence to aseptic technique can't be ensured, replace catheters as soon as possible and after no longer than 48 hours
- ❑ Replace short-term central vascular access devices (CVADs) if purulence is observed at insertion site, which indicates infection
- ❑ Replace CVADs if resident is hemodynamically unstable and CR-BSI is suspected

Omnicare
Pharmacy Services

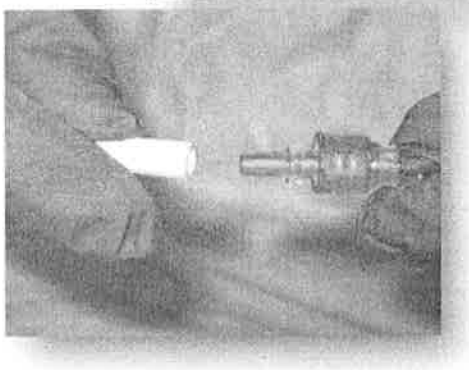
INFECTION CONTROL
NO "LOOPING"

Looping describes a practice whereby clinicians attach the exposed end of the IV administration set to a "Y" site or "injection port" on the same administration set to maintain sterility. It is often done when a sterile end cap is not available during disconnection of an intermittent medication.

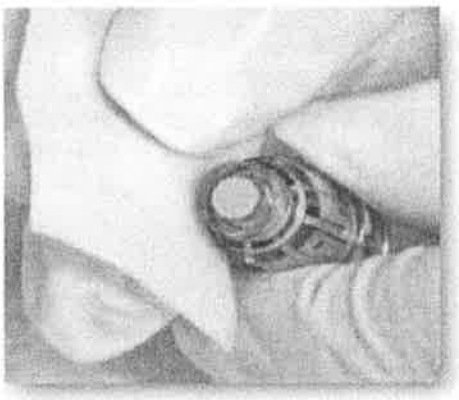


The practice of looping is not recommended by the Infusion Nurses Society (INS).

- **Looping** causes an unacceptable breach in technique
- The Y site on the administration set is exposed to ambient air and environmental contaminants, increasing the risk that microorganisms may be introduced into the bloodstream via the male end of the administration set upon subsequent use



- The INS Standards of Practice indicate that "a compatible sterile covering (end cap) should be aseptically attached after each intermittent use"
- ***Attach*** a new sterile end cap ***every time*** the administration set is disconnected



Vigorously cleanse catheter hubs, injection ports and needleless connectors with alcohol wipe prior to every access and allow to air dry.

12/09 rev 3/13

Omnicare
Pharmacy Services

Infection Control:
IV Administration Sets

The impact of good hand hygiene on the spread of infection is well documented. Less publicized, unsafe IV medication administration practice habits also place residents in danger of serious Healthcare Associated Infections (HAI). Maintaining a closed system when handling IV administration sets is critical to the prevention of HAIs.

- ***Wash your hands and don gloves*** prior to all infusion related procedures
- ***Maintain*** asepsis when administering IV medications and fluids
- ***Change IV administration sets:***
  Every 24° for primary intermittent

  Example: Cefepime *1 Gram every 12 hours*

  Every 96° for primary continuous

  Example: *D_5NS @ 60 mL/hr continuously*

  Every 96° for primary and secondary continuous *

  Example: *D_5 ½ NS @ 50 mL/hr continuously and Ampicillin 500mg every 4 hours*

  Every 24° for TPN and PPN

  *Once a secondary administration set is detached from the primary administration set, the secondary administration set should be considered a primary intermittent administration set and must be changed every 24°

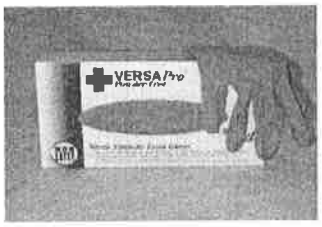
- ***Inspect*** the integrity of the IV administration set package. If there is any doubt, throw it out!
- ***Label*** IV administration set with date, time and nurse's initials
- ***Never*** "loop" IV administration sets. IV looping is the practice of attaching the distal end of the IV administration set to an upper Y-site on the administration set when a sterile end cap is not available. This technique increases the risk that microorganism will be introduced into the IV administration set because the upper Y-site is exposed to ambient air and potential contaminants.
- ***Dispose*** of any administration set that is found uncapped or is potentially contaminated
- ***Vigorously cleanse*** the needleless y-site of the primary set with alcohol and allow to air dry prior to attaching the secondary set
- ***Always*** keep secondary administration sets attached to the primary administration set maintaining a closed system unless an additional secondary medication must be administered through the primary set. *Example: D_5 ½ NS is running at 40 mL/hr through the primary set with Vancomycin administered intermittently through the secondary set. The Vancomycin set is left attached to the primary set unless an additional intermittent medication is prescribed.*
- ***Always*** aseptically attach a new sterile cap on the male end of a reusable IV secondary administration set that has been removed from any primary administration set between use
- ***Always*** aseptically attach a new sterile end cap at the distal end of intermittent IV tubing when disconnected from the IV catheter source
- ***Vigorously cleanse*** the needleless connector with alcohol and allow to air dry prior to accessing

Omnicare
Pharmacy Services

Infection Control
Clean vs Aseptic vs Sterile
What's the difference?

Clean Technique refers to the use of routine hand washing, hand drying and may include the use of non-sterile gloves. Use clean technique if staff, or objects, will touch intact skin, intact mucous membranes or dirty (contaminated) items.

- Taking blood pressures
- Examining residents
- Feeding residents



Aseptic Technique refers to mechanisms employed to reduce potential contamination by microorganisms. Those mechanisms ***may*** include the use of handwashing and sterile gloves.

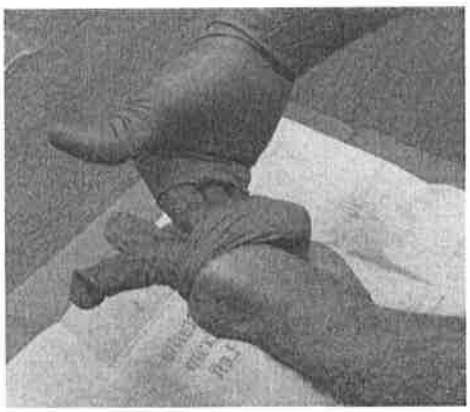
All IV therapy procedures should employ aseptic technique, but those listed below do not require the use of sterile gloves and a sterile field.

- Short-peripheral IV catheter insertion
- Hypodermoclysis needle insertion
- Hanging a new medication or solution
- Changing the administration set
- Needleless connector change
- Drawing blood from a central vascular access device

Sterile is defined as free from living organisms.

Aseptic technique employing thorough handwashing, donning of sterile gloves and maintaining a sterile field must be utilized when:

- Inserting a midline or PICC
- Changing a midline or central dressing
- Accessing an implanted port



<u>Tips</u>

- Never turn your back on your sterile field
- Put only sterile items on a sterile field
- Keep clean, dirty, and sterile items separate
- The sterile field is considered sterile except for one inch around perimeter
- Change gloves and wash hands if going from a contaminated act to an aseptic act
- Wet items are considered contaminated

Omnicare
Pharmacy Services

NOTE: The nurse is responsible for reviewing the complete policy for indicated therapies before performing infusion therapy.

DEVICE May be valved or non-valved	FLUSH PROTOCOLS The nurse administering the flush must assess the resident for any condition that may require a change in concentration and/or volume. Verify Patency: The nurse should aspirate the catheter for blood return prior to administration of medications and solutions.				SITE MAINTENANCE		ADMINISTRATION SET CHANGES *Once a secondary administration set is detached from the primary administration set, the secondary administration set should be considered a primary intermittent administration set.		
	Maintenance Flush each lumen	Intermittent Non-Valved	Intermittent Valved	Blood Draws	Transparent Dressing Change	Needleless Connector	Primary and Secondary Continuous (piggyback)*	Primary Intermittent	Parenteral Nutrition (PN)
Peripheral	Q 12" 10ml NS	10 ml NS infuse medication then 10ml NS		N/A	When compromised	With each new insertion	96" and with each IV start	24"	24" No TPN PPN only
Midline	Non-valved Q 12" 10ml NS 3 ml 10 units/ml heparin Valved catheter 10 ml NS Q week	10 ml NS infuse medication then 10ml NS follow with 3 ml 10 units/ml heparin	10 ml NS infuse medication then 10 ml NS	Not recommended Refer to procedure	24" post insertion or on admission, then Q week & prn Measure external catheter length on admission, with each dressing change and prn	• On admission • Q week • Prn • After blood transfusion	96"	24"	24" No TPN PPN only
PICC	Non-valved Q 12" 10 ml NS 5 ml 10 units/ml heparin Valved catheter 10 ml NS Q week	10 ml NS infuse medication then 10 ml NS follow with 5ml 10 units/ml heparin	10 ml NS infuse medication then 10ml NS	10 ml NS 5 ml discard, draw labs Then 20 ml NS If non-valved, follow with 5 ml 10units/ml heparin	24" post insertion or on admission, then Q week & prn Measure external catheter length on admission, with each dressing change and prn	• On admission • Q week & prn • Q 24" with TPN • After blood draws • After blood transfusion	96"	24"	24"
Non Tunneled (Subclavian, Jugular, Femoral)	Non-valved Q 24" 10ml NS 5 ml 10 units/ml heparin Valved catheter 10 ml NS Q week	10ml NS infuse medication then 10 ml NS follow with 5ml 10 units/ml heparin	10 ml NS infuse medication then 10ml NS	10 ml NS 5 ml discard, draw labs Then 20 ml NS If non-valved, follow with 5 ml 10 units/ml heparin	• On admission • Q week & prn • Measure external catheter length on admission, with each dressing change and prn	• On admission • Q week & prn • Q 24" with TPN • After blood draws • After blood transfusion	96"	24"	24"
Tunneled	Non-valved Q 24" 10ml NS 5ml 10 units/ml heparin Valved catheter 10 ml NS Q week	10 ml NS infuse medication then 10ml NS follow with 5 ml 10 units/ml heparin	10ml NS infuse medication then 10 ml NS	10 ml NS 5 ml discard, draw labs Then 20 ml NS If non-valved, follow with 5 ml 10 units/ml heparin	• On admission • Q week & prn • Measure external catheter length on admission, with each dressing change and prn	• On admission • Q week & prn • Q 24" with TPN • After blood draws • After blood transfusion	96"	24"	24"
Implanted Venous Port	If accessed Q 24 If not accessed Q month 10ml NS 5 ml 100 units/ml heparin Valved port: Accessed 10 ml NS Q wk Not Accessed 10 ml NS Q month	10 ml NS infuse medication then 10ml NS follow with 5 ml 100 units/ml heparin	10 ml NS infuse medication then 10 ml NS	10 ml NS 5 ml discard, draw labs Then 20 ml NS If non-valved, follow with 5 ml 100 units/ml heparin	• On admission • Q week & prn • Change non-coring needle Q week	• On admission • Q week & prn • Q 24" with TPN • After blood draws • After blood transfusion	96"	24"	24"

Valved: Valved catheters have an integral valve in the catheter therefore requires saline only flushing. (e.g., Groshong®, PASV®, SOLO®)
Non-Valved: Non-valved catheters require heparin flushing after med administration EXCEPT peripheral catheters. Peripheral catheters require saline flushing only.
Dressing Changes: Gauze dressings are only used if resident has allergy or problem with transparent dressing and must be changed at least every two days.
Measurements: For all midlines and external CVC's measure external catheter length upon insertion, admission, with each dressing change, and prn.
Syringe Size: To minimize the risk of catheter damage, the size of the syringe used for flushing should be 10 ml barrel diameter or larger.

References

1) Catheter occlusion can compromise patient care: Lytic experience. Retrieved November 8, 2013 from www.cathflo.com

2) Failure to cap IV tubing and disinfect IV ports places patients at risk for infections. *Nurse Advise-ERR.* Retrieved January 04, 2010 from www.ismp.org/newsletters/nursing/Issues/NurseAdviseERR200711.pdf

3) Hadaway, L., Flushing vascular access catheters: Risks for infection control. *Infection Control Resource.* Retrieved January 4, 2010, from www.infectioncontrolresource.org/Past_Issues/IC14.pdf

4) Infusion Nurses Society. (2011, Supplement to January/February). Infusion Nursing Standards of Practice. Journal of Infusion Nursing, 34(1S).

5) Infusion Nurses Society Flushing Protocols. 2008 Infusion Nurses Society, Norwood, MA. www.ins1.org

6) Ryder, M. (2005). Catheter-related infections: It's all about biofilm. *Topics in Advanced Practice Nursing eJournal.* Retrieved January 4, 2010 from http://www.medscape.com/viewarticle/508109_1

7) The Joint Commission. (2013) Long term care. National Patient Safety goals for 2013. Retrieved November 8, 2013 from http://www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals

Omnicare
Pharmacy Services

Post Test

Circle the most appropriate answer:

1) What is the most recent finding related to catheter occlusion?
   a. 75% of central catheter lines are occluded
   b. 1 out of every 4 central venous catheters becomes occluded

2) According to a report issued by M. Ryder, which of the following is true?
   a. Biofilm decreases the risk of bloodstream infections
   b. 87% of all bloodstream infections are associated with the presence of some type of intravascular device

3) Which of the following recommendations was issued by the Centers for Disease Control and Prevention and the American Academy of Pediatrics?
   a. Recommended routine replacement of catheters is a strategy to prevent infections
   b. Recommended against routine replacement of catheters stating that there is no evidence that replacement lowers infection rates

4) Acceptable infusion practices include:
   a. Looping
   b. *Vigorously* cleanse the needleless access device with antiseptic prior to every access

5) Biofilm is described as:
   a. collections of microorganisms surrounded by the slime they secrete
   b. an integral part of the clotting cascade

6) Administration sets used for intermittent therapy are changed:
   a. every 24 hours
   b. every 96 hours

Omnicare
Pharmacy Services

Post Test: ANSWER KEY

1) What is the most recent finding related to catheter occlusion?
   a. 75% of central catheter lines are occluded
   b. 1 out of every 4 central venous catheters becomes occluded

2) According to a report issued by M. Ryder, which of the following is true?
   a. Biofilm decreases the risk of bloodstream infections
   b. 87% of all bloodstream infections are associated with the presence of some type of intravascular device

3) Which of the following recommendations was issued by the Centers for Disease Control and Prevention and the American Academy of Pediatrics?
   a. Recommended routine replacement of catheters is a strategy to prevent infections
   b. Recommended against routine replacement of catheters stating that there is no evidence that replacement lowers infection rates

4) Acceptable infusion practices include:
   a. Looping
   b. *Vigorously* cleanse the needleless connector with antiseptic prior to every access

5) Biofilm is described as:
   a. collections of microorganisms surrounded by the slime they secrete
   b. an integral part of the clotting cascade

6) Administration sets used for intermittent therapy are changed:
   a. every 24 hours
   b. every 96 hours

Omnicare
Pharmacy Services

LICENSED NURSE SELF STUDY EVALUATION TOOL

"Strategies for the Prevention of Catheter Related Bloodstream Infections"

Name of Participant: _____

LTC Facility: _____

1.	The learner objectives were stated clearly	True	False
2.	The intention of The Joint Commission National Patient Safety Goal is clearly defined	True	False
3.	The information will help me in my clinical practice to promote good Infection Control practices and recognize /correct inappropriate practices that can lead to bacterial growth and infection	True	False
4.	Following review of this information, I feel more confident in communicating the necessity of good infection control practice	True	False

Additional Comments:

_____

_____

_____

_____

Omnicare
Pharmacy Services

Certificate of Completion

This is to certify that

_____

has successfully completed

Strategies to Prevent Catheter Related Bloodstream Infections

A self-study educational program presented by Omnicare Infusion Services

_____ _____

Facility Education Coordinator Date of Completion