The Importance of Proactive CVAD Care and Maintenance

CVAD=central venous access device.
Disclosures

• This program is presented on behalf of Genentech and the information is consistent with FDA guidelines

• I have been compensated by Genentech to serve as a speaker for this program

• This program is intended to provide general information about catheter management and not medical advice for any particular patient

• This program may be monitored by Genentech for adherence to program requirements
Objectives

1. Discuss why proactive CVAD care is so important
2. Review why nurses should routinely assess for CVAD patency
3. Explore a program that includes patency and competency checks to help improve proactive CVAD care and maintenance in your hospital

CVAD = central venous access device.

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Objectives

1. Discuss why proactive CVAD care is so important
2. Review why nurses should routinely assess for CVAD patency
3. Explore a program that includes patency and competency checks to help improve proactive CVAD care and maintenance in your hospital

[Audience questions: What is currently top of mind for you with regard to CVAD care? How are you thinking of improving CVAD care this year?]
Why is CVAD care and maintenance so important?

"Avoiding catheter occlusion can limit interruption of therapy, reduce risk of trauma to the patient, and decrease the risk of complications and costs."


CVAD=central venous access device.


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Why is CVAD care and maintenance so important?

• Poor catheter management may lead to serious consequences that can impact hospital efficiency and quality of patient care

• One serious consequence is thrombotic occlusion. If the proper steps are taken to proactively implement quality central venous access device (CVAD) care in your institution, you can help to avoid and detect occlusions before they lead to more serious consequences (Richardson 2007) (Wingerter 2003)
  — From an expert in the field of catheter management:
  "Avoiding catheter occlusion can limit interruption of therapy, reduce risk of trauma to the patient, and decrease the risk of complications and costs." (Hadaway 2005)

• This presentation will emphasize the importance of proper CVAD care and maintenance, focusing on patency checks—how to effectively check for patency according to the INS, and how to implement a patency protocol in your own institution

INS=Infusion Nurses Society.
Catheter occlusion is the most common noninfectious complication

- 1 in 4 catheters may become occluded, having a serious impact on patient outcomes \(^1\)
- About 58% of catheter occlusions are thrombotic \(^1\)
- Catheter occlusions may occur soon after insertion of a device or develop during the course of IV therapy \(^2\)
- Clinical signs include any of the following: the inability to withdraw blood, inability to infuse fluids, pain, swelling, or leakage \(^2\)

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Catheter occlusion is the most common noninfectious complication
- Catheter occlusion is the most common noninfectious complication in the long-term use of central venous access devices (CVADs) (McKnight 2004)
- 1 in 4 catheters may become occluded, having a serious impact on patient outcomes (INS)
- About 58% of catheter occlusions are thrombotic (Stephens 1995)
- Thrombotic occlusions result from the formation of a thrombus within, surrounding, or at the tip of the catheter (NIH 1999)
- Catheter occlusions may occur soon after insertion of a device or develop during the course of IV therapy (Stephens 1995)
- Clinical signs include any of the following: the inability to withdraw blood, inability to infuse fluids, pain, swelling, or leakage (Stephens 1995)

[Audience questions: Do you know the prevalence of occlusions in your organization? What impact do you think occlusions can have on patient outcomes?]
Nurses need to proactively assess CVADs for patency

"The nurse should aspirate for a positive blood return from the vascular access device (VAD) to confirm device patency prior to administration of parenteral medications and solutions."

—Infusion Nurses Society (INS) Standards of Practice, 2011

"Ensure patency by flushing all lumens following institution policy. If lack of blood return or sluggish flow* is encountered, take measures to ensure patency."

—Association for Vascular Access (AVA) I SAVE That Line campaign

CVAD=central venous access device.

*According to the Oncology Nursing Advisory Board, sluggish flow is defined as blood return of ≤3 mL in 3 seconds.  


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Nurses need to proactively assess CVADs for patency

• To ensure that a line is patent, the healthcare provider should always aspirate for a brisk, free-flowing blood return (INS 2011)
  — This is the ability to withdraw blood at 3 mL in 3 seconds, as defined by the Oncology Nursing Advisory Board (Cummings-Winfield 2008)
• Beyond a lack of free-flowing blood return, the healthcare provider should also be aware of all signs of a blockage, including (McKnight 2004) (Hadaway 2005)
  — Inability to infuse fluids
  — Increased resistance when flushing
• It’s important to remember that flushing the line is not enough. The healthcare provider must be able to withdraw blood before ruling out a partial occlusion. With a partial occlusion, infusion is possible, but aspiration is not (INS 2011) (Camp-Sorrell 2004)
Occluded catheters may have a serious impact on patients

Complications from catheter occlusions include:

- Extravasation\(^1,2\)
- Infiltration\(^1\)
- Delayed administration of critical therapies\(^3\)
- Thrombophlebitis\(^4\)
- Venous thrombosis (rare)\(^5\)
- Potential loss of site and replacement of line\(^6\)
- Increased length of stay and delayed discharge\(^7\)

**References:**

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**Occluded catheters may have a serious impact on patients**

An undetected catheter occlusion may lead to serious, painful consequences that can worsen a patient’s condition. These include:

- **Extravasation:** the result of vesicant fluids leaking into the surrounding tissues; can lead to pain, swelling, and tissue necrosis (INS 2011) (Mayo 1995)
- **Infiltration:** the leaking of nonvesicant fluids into the surrounding tissues; can cause pain, discoloration, and swelling (INS 2011)
- **Blocked or delayed administration of critical therapies to patients** (Nakazawa 2010)
- **Thrombophlebitis:** vein inflammation that can occur from the development of a fibrin sheath (Herbst 1996)
- **Venous thrombosis (rare):** a rare yet potential complication, along with pulmonary embolism (Wingerter 2003)
- **Potential loss of site and replacement of the line** (Cummings-Winfield 2008)
- **Increased length of stay and delayed discharge** (Warye 2009)
The association between occlusion and infection

Central line–associated bloodstream infections (CLABSIs) are one of the most deadly types of hospital-acquired infections, with a mortality rate of up to 25%¹

- The CDC estimates approximately 41,000 CLABSIs occur annually in the United States¹
- According to the Joint Commission, CLABSIs can result in up to a 3-week hospital stay²

References:

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The association between occlusion and infection

- Studies show an association between thrombotic catheter occlusion and catheter colonization or sepsis (Segreti 2011) (Raad 1994) (Timsit 1998)
  - Raad et al found a 23% incidence of central line–associated bloodstream infections (CLABSIs) in postmortem patients (N=72) with thrombotically occluded catheters (Raad 1994)
  - Patients without a thrombotic occlusion had zero CLABSIs
  - Timsit et al reported that the presence of catheter-related thrombosis (N=208) increased the risk of catheter-related sepsis by 2.6-fold (Timsit 1998)
- How is thrombus formation associated with infection risk?
  - It’s caused by the interaction of fibrin, blood components, and a biofilm layer that attracts, encloses, and protects bacteria and other microorganisms (Ryder 2001) (Hadaway 2005)
  - Aggressive flushing may shear off part of the biofilm or thrombus, releasing microorganisms into the bloodstream (Ryder 2001) (Hadaway 2005)
- What is the potential impact of CLABSIs? (Joint Commission 2012)
  - CLABSIs are one of the most deadly types of hospital-acquired infections, with a mortality rate of up to 25%
  - The CDC estimates approximately 41,000 CLABSIs occur annually in the United States
  - According to the Joint Commission, CLABSIs can result in an up-to-3-week hospital stay

CDC=Centers for Disease Control and Prevention.
Thrombotic occlusions may impact cost of care

- Replacing a line costs between $1,012 and $2,682

- Central line–associated bloodstream infections (CLABSIs) may cost $16,155 per patient, according to a recent study

- Hospitals do NOT receive higher payment rates for CLABSIs

- Hospital value-based purchasing: CLABSIs will account for 30% of a total performance score

References:

*CMS Final Hospital Outpatient Prospective Payment System (OPPS) payment plus minimum adjusted copayment.
Central line–associated bloodstream infections (CLABSI) data can be easily accessed on Medicare.gov’s Hospital Compare website.

Most hospital-acquired infections—including CLABSI—can be prevented through proper precautions and procedures.

Proper procedure can pay off

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Questions for audience: Are you familiar with how your hospital is performing in terms of CLABSI rates? Do you know where you stand against other organizations and the national benchmark? This particular institution’s CLABSI rates are worse than the national benchmark—do you have any thoughts on what could have caused this?
Take action: Implement a program for proactive CVAD care and maintenance

Assess needs and identify gaps

Review policies and procedures and standardize patency checks

Create an education plan with competency checks

Monitor metrics to evaluate effectiveness and share performance

CVAD=central venous access device.

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Take action: Implement a program for proactive CVAD care and maintenance

It’s time to take action with a plan for implementation.

- Assess needs and identify gaps
- Review policies and procedures throughout the hospital and standardize patency checks
- Create an education plan with competency checks
- Establish and monitor metrics to evaluate the effectiveness of the implemented plan and share performance

CVAD=central venous access device.
Assess needs and identify gaps

- Establish baseline data and identify gaps in knowledge, competency, and processes as they relate to your staff’s protocol on central venous access device (CVAD) care and checking for patency\(^1,2\)

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Other expert recommendations to determine how your institution is performing:

- Assess needs by recording the steps taken for CVAD care and maintenance
- Trends can be realized through the accurate collection of audit data (Harapel 2013)
- Genentech's CVAD Quality Tracker (see slide 23 in the Appendix) can provide you with an overall view on how your institution is performing in terms of properly maintaining the function of a central line
  - Provides documentation that a healthcare provider has walked through the appropriate steps when performing care and maintenance of a patient’s CVAD, and can be used to evaluate improvement or any gaps in proper CVAD care
  - Provides a necessary step in checking for patency, ensuring that the healthcare provider is assessing the line for a brisk blood return
- Genentech Nurse Surveys can help gauge the knowledge of nurses who manage central lines (see slide 24 in the Appendix)

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References:


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Assess needs and identify gaps

- Establish baseline data and identify gaps in knowledge, competency, and processes as they relate to your staff’s protocol on central venous access device (CVAD) care and checking for patency (McCarthy 2006) (Johns Hopkins Quality and Safety Research Group 2014)
  - Assess needs by recording the steps taken for CVAD care and maintenance
  - Trends can be realized through the accurate collection of audit data (Harapel 2013)
  - Genentech’s CVAD Quality Tracker (see slide 23 in the Appendix) can provide you with an overall view on how your institution is performing in terms of properly maintaining the function of a central line
    - Provides documentation that a healthcare provider has walked through the appropriate steps when performing care and maintenance of a patient’s CVAD, and can be used to evaluate improvement or any gaps in proper CVAD care
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  - Genentech Nurse Surveys can help gauge the knowledge of nurses who manage central lines (see slide 24 in the Appendix)

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Other expert recommendations to determine how your institution is performing:

- Assess the implications of catheter occlusions, including the overall costs of central line–associated bloodstream infections (CLABSSIs) (Johns Hopkins Quality and Safety Research Group 2014)
- If possible, complete a root cause analysis of all infections to determine how many are related to CVAD care or thrombotic occlusion (Data on file 2009)
Review policies and procedures

Review your organization’s policies, procedures, and protocols. Are they aligned to evidence-based standards?

Example of evidence-based protocol from the Association for Vascular Access

Standardization is key to implementing hospital-wide improvement (INS 2011)

- Develop and integrate evidence-based, standardized policies and procedures
  - Is checking patency, as indicated by the Infusion Nurses Society and the Oncology Nursing Advisory Board, part of your policies and procedures?
  - Is your organization aligned with the National Institutes of Health when faced with an occlusion? When a catheter becomes occluded, the main goal is to restore function (NIH 1999)
  - Use the CDC, IHI, and AVA as a guide for overall central venous access device (CVAD) care and maintenance. They offer specific, best practices for the care and maintenance of central lines, included in best practices bundles

- Integrate policies and procedures aimed at reducing the risk of thrombotic occlusions and central line–associated bloodstream infections (CLABSSIs) in each unit (Joint Commission 2014)
  - Develop a “patency pact” in your hospital: institutionalize hospital-wide patency checks to always keep patency top of mind
    - Make sure that everyone in your hospital understands the value of patency. By doing this you can ensure that it is always a focus and an essential part of hospital-wide protocol, and is included on central line checklists and quality trackers
  - Institutionalize central line bundles in your staff’s protocol (Joint Commission 2014) (IHI 2012) (O’Grady 2011)
    - Care bundles are groupings of best practices with respect to a disease process that individually improve care, but when applied together result in substantially greater improvement (IHI 2012) (O’Grady 2011)
    - Use checklists for insertions with instructions to halt the procedure for breaks in sterile technique

CDC=Centers for Disease Control and Prevention; IHI=Institute for Healthcare Improvement; AVA=Association for Vascular Access.
Are your protocols aligned with evidence-based standards?

Your protocol for CVAD insertion, care, and maintenance
This central line insertion strategy should be the protocol for every drug that will be administered through a central venous access device (CVAD). Bundled strategies improve performance and act as benchmarks for performance improvement. They should be implemented together, rather than individually, for better outcomes.

Five key components of essential CVAD care and maintenance:

1. Hand hygiene
2. Maximal barrier precautions
3. Chlorhexidine skin antisepsis
4. Optimal catheter site selection, avoiding the use of the femoral vein for central venous access in adult patients
5. Daily review of line necessity, with the prompt removal of unnecessary lines

References:

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Are your protocols aligned with evidence-based standards?
Bundled strategies improve performance and act as benchmarks for performance improvement. They should be implemented together, rather than individually, for better outcomes. These steps can be incorporated into a central venous access device (CVAD) checklist or quality tracker to ensure protocol is being followed.

The “central line bundle,” 5 key components for CVAD care and maintenance, comprises (IHI 2014)

1. Hand hygiene
   - Wash hands, or use an alcohol-based, waterless hand cleaner to help prevent infection
2. Maximal barrier precautions
   - Strict compliance with washing hands, wearing a cap and sterile gown, and gloves
3. Chlorhexidine skin antisepsis
   - A better skin antisepsis than other agents and proven in reducing infection
4. Optimal catheter site selection, avoiding the use of the femoral vein for central venous access in adult patients
   - Site of insertion is not a risk factor for infection when experienced physicians insert the catheters, strict sterile technique is used, and trained intensive care unit nursing staff perform catheter care. In addition, some studies cite that the femoral site is a greater risk factor in patients
5. Daily review of line necessity, with the prompt removal of unnecessary lines
   - Risk of infection increases over time. Risk is reduced when an unnecessary line is removed

Other bodies, such as the CDC and the SHEA/IDSA, add 2 more recommendations:
- Educate healthcare workers on indications and proper procedures for IV catheters
- Use of checklists for insertions with instructions to halt the procedure for breaks in sterile technique

CDC=Centers for Disease Control and Prevention; SHEA=Society for Healthcare Epidemiology of America; IDSA=Infectious Diseases Society of America.
Are your protocols aligned with evidence-based standards?

Prior to administration of medications or solutions:

- **Aspirate for positive blood return**
  (3 mL in 3 seconds)
- **Flush the line to determine resistance**
- **Palpate insertion site**
- **Assess patient for pain or discomfort**

*Based on standards from the INS and Oncology Nursing Advisory Board.*


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Are your protocols aligned with evidence-based standards?

A routine assessment for catheter functionality, based on standards from the INS and Oncology Nursing Advisory Board

Patency should be checked

- **Prior to the administration of any medications or solutions**

A complete assessment for patency should include the following:

- **Aspiration for positive blood return**
  - Defined by the Oncology Nursing Advisory Board as 3 mL in 3 seconds
  - Indications of a blockage include (McKnight 2004) (Hadaway 2005):
    - Lack of blood return
    - Sluggish blood return
    - Inability to withdraw fluids

- **Attempt to flush to determine resistance**
  - When flushing a connector or CVAD, flush with an adequate volume of saline or appropriate flush solution
  - Palpate insertion site
  - Palpation is especially important with a peripheral catheter; it can help determine tenderness or other indications of a central line–associated bloodstream infection (CLABSI)

- **Assess patient for pain or discomfort**

[Question to audience: To what extent are your nurses aspirating for brisk blood return before administration of medications?]
Are your protocols aligned with evidence-based standards?

Your protocol for CVAD functionality

1. Sluggish flow or inability to withdraw blood or infuse fluid through the catheter
2. Check for presence of mechanical obstruction
3. Suspect thrombotic occlusion
4. Flow restored
5. Obstruction remains

- Make sure you have an organization-wide protocol to manage occluded central venous access devices (CVADs)
  - Clinicians need to ask questions
    - Is it a thrombotic occlusion or something else?
    - A mechanical obstruction should first be ruled out
- Nurses should be trained to assess the cause of a dysfunctional catheter
  - Nonthrombotic causes that could result in no brisk blood return include (Nakazawa 2010)
    - Tip migration
    - Catheter damage (pinch-off syndrome), kinks in the catheter, catheter breakage
    - Disconnection of the catheter from the implanted port

Some questions to ask if you do not get a brisk blood return (INS 2011):
- Sudden occurrence or a slow reduction in blood?
- Is there discomfort, pain, or edema at the insertion site?
- Does the blood return change based on the position of the patient?
- What fluids and medications have recently been infused?

- If no external cause can be found, then the nurse can determine that this is a thrombotic occlusion
- When a catheter becomes occluded, the main goal is to restore function

References:

Adapted from McKnight S.
Standardize patency checks and create a culture of accountability

Institute patency checks in electronic health records and/or nursing notes so that checking for patency is standardized and documented throughout the hospital

Identify a champion to support initiative

Create incentives for adhering to protocol

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Standardize patency checks and create a culture of accountability

Once you’ve established your protocol, how can you create increased vigilance around patency checks in your hospital?

• Institute patency checks in electronic health records and/or nursing notes so that checking for patency is standardized and documented throughout the institution
  — A custom field can be added into electronic health records to monitor for improvement and to encourage daily checks for patency (Harpel 2013)
  — If electronic health records are not available, nurses can document patency checks in their notes or with a CVAD checklist, and include them with the patient chart

• Identify a champion to support initiative (Pronovost 2010) (On the CUSP 2014)
  — Hospital leaders will be responsible for monitoring infection rates and supporting/championing prevention initiatives (Pronovost 2010)

• Assembling a vascular resource team can also help with educational initiatives and in initiating and guiding procedures (Harpel 2013)

• Clinicians inserting and maintaining catheters must be accountable for performance, complying with evidence-based practices (Pronovost 2010)

• Create incentives for adhering to protocol
  — Competitions, awards, certificates—any program that keeps patency top of mind and helps staff strive toward following procedure

[Questions to audience: How can your hospital standardize patency checks? Are nurses expected to check for patency on every shift?]
Create an education plan to support patency and CVAD care

“Educate staff ... about central line-associated bloodstream infections and the importance of prevention.”

—The Joint Commission, 2015 National Patient Safety Goals

Ensure competency checks for proper CVAD insertion and maintenance.

CVAD=central venous access device.


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Create an education plan to support patency and CVAD care

An education plan may inspire confidence and encourage adherence to procedures

• Provide consistent education
  — Aim for quarterly or annual education (Joint Commission 2015)

• Educate healthcare workers on indications and proper procedures for IV catheters (Nakazawa 2010)

• Ensure competency checks
  — Ensure competency checks for proper CVAD insertion and maintenance (O’Grady 2011)
3 steps to monitor progress

1. Identify key metrics and document CVAD assessments
   - Establish and monitor metrics to evaluate the effectiveness of the implemented plan (Data on file, Moureau)
     — According to the National Patient Safety Goals, compliance with evidence-based practices should be monitored, and the effectiveness of infection prevention efforts should be evaluated (Joint Commission 2015)

2. Regularly gather and assess data
   - Identify a team member to gather, analyze, and periodically report data
     — This could be a member of the vascular access team (Harpel 2013) (Data on file)
   - Assess quality improvement by frequently checking for patency
     — Utilize a CVAD quality tracker (Harpel 2013)
   - Conduct periodic risk assessments for central line–associated bloodstream infections (CLABSIs) (Joint Commission 2015)
   - Document initial and ongoing CVAD assessments, nursing assessments, interventions, and patient responses (INS 2011)
   - Monitor knowledge and competency related to procedures, including patency checks

3. Share results, identify corrective actions, and reevaluate your goals
   - Continuously share results with key stakeholders, and reevaluate new goals and targets for improvement
How Genentech can help

Genentech offers a variety of resources to help your institution with education and training:

- In-person peer-to-peer training
- Speaker’s bureau
- CathMatters.com
- CathEd™: Interactive Learning Management System
- HealthStream.com

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How Genentech can help
Genentech offers a variety of resources to help your institution with education and training.

**In-person and peer-to-peer training**
- In-person training for small groups of nurses, helping to train staff with experts in vascular access using hands-on, peer-to-peer education on the principles of good catheter management

**Speaker’s bureau**
- Thought-leader education on a broad range of catheter-management topics
- Speaker presentation on-site or via Web

**CathMatters.com**
- A comprehensive resource for practical tools, support, and information designed to help enhance catheter management. Helps to improve skills through interactive learning based on unique needs

**CathEd™: Interactive Learning Management System**
- Teaches central line assessment and management in an engaging digital format—videos, illustrations, and animations are available

**HealthStream.com**
- Educates nurses on the importance of central line assessment and proactive management of catheters
Summary: What have we learned?

- **Catheter occlusion** is the most common noninfectious complication, with 1 in 4 catheters becoming occluded.
- Infection due to **thrombotic occlusion** may have a serious impact on your patients and on the reputation of your hospital.
- Patency checks should be **standardized** across the hospital.

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**Summary: What have we learned?**

- Catheter occlusion is the most common noninfectious complication, with 1 in 4 catheters becoming occluded.
- Infection due to thrombotic occlusion may have a serious impact on your patients and on the reputation of your hospital.
- Patency checks should be standardized across the hospital.
Appendix
Assess needs and identify gaps

CVAD/PICC Line—Care & Maintenance Checklist

- Determine how your organization is performing
- Evaluate improvements and identify gaps
- Ensure patency checks

CVAD=central venous access device; PICC=peripherally inserted central catheter.

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Assess needs and identify gaps
- Genentech’s CVAD Quality Tracker can provide you with an overall view on how your organization is performing in terms of properly maintaining the function of a central line
  - Provides documentation that a healthcare provider has walked through the appropriate steps when performing care and maintenance of a patient’s CVAD, and can be used to evaluate improvement or any gaps in proper CVAD care
  - Provides a necessary step in checking for patency, ensuring that the healthcare provider is assessing the line for a brisk blood return

CVAD=central venous access device.
Create an education plan to support patency and CVAD care

Nurses Survey

<table>
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<tr>
<th>Department</th>
<th>Shift</th>
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1. According to the INS (Infusion Nurses Society) Standards of Practice, when should a central venous access device (CVAD) be assessed for patency?  
   A. At the beginning or end of a shift  
   B. At least once daily  
   C. Before infusing medications/fluids  
   D. At dressing change  

2. How do you define a patent catheter?  
   3. How do you define a dysfunctional catheter?  

4. How often do you see a line/lumen passed off as “not working”?  
   A. Never  
   B. Daily  
   C. More than twice per week  
   D. Other  

5. How do you communicate the condition of a patient’s CVAD to the nurse on the next shift? (Circle all that apply)  
   A. Electronic Medical Records (EMR)  
   B. Written shift report  
   C. Verbal report  
   D. I don’t report the condition unless it’s not working  

6. Is it necessary to have each/all lumen(s) functioning in a multilumen catheter?  
   A. Yes  
   B. No  

- Help gauge the knowledge of nurse administrators and nurse educators  
- Ask questions essential to quality CVAD care and maintenance, including adherence to proper procedure based on expert guidelines

CVAD=central venous access device.

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Create an education plan to support patency and CVAD care

Evaluate knowledge with Genentech Nurse Surveys

- Help gauge the knowledge of nurse administrators and nurse educators  
- Ask questions essential to quality CVAD care and maintenance, including adherence to correct procedures and expert guidelines
References


References (cont’d)


References (cont’d)


References (cont’d)


References (cont’d)


