Outline

• Importance of Bloodstream Infections (BSIs)

• BSI Prevention Successes

• Resources & Tools
  – New video, poster, patient materials
Dialysis and Burden of Bloodstream Infections (BSIs)

- **Bloodstream infections in hemodialysis**
  - Hospitalizations for BSI increasing over time\(^1\)
  - Priority prevention area in Dept of Health and Human Services National Action Plan\(^2\)
  - 60-70% of all BSIs occur in catheter patients

- **Central line-associated BSIs (CLABSI)**\(^3\)
  - 37,000 estimated in hemodialysis outpatients
  - 41,000 in all inpatients
  - Attributable mortality: 12-25%
  - Cost: $3,700 - $28,000 per episode

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3. CDC. MMWR 2011; 60(08);243-248
Following CDC Protocols Cuts Dialysis Bloodstream Infections in Half

CDC provides tools to help all U.S. dialysis facilities reduce potentially deadly infections

Bloodstream Infection Rates in Outpatient Hemodialysis Facilities Participating in a Collaborative Prevention Effort: A Quality Improvement Report

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Mary Lincoln, BSN, MHA
Kathy Morrissette, RN, RVT
Curt Lindberg, DMan
John A. Jemigan, MD, MS
Alexander J. Kallen, MD, MPH
CDC Dialysis BSI Prevention Collaborative
2009 - Present

- Collaborative approach to BSI prevention
- Goal to demonstrate preventability
  - Through increased adherence to existing recommendations
- Measure infection rates using NHSN
- Intervention package
  - Based on CDC/HICPAC recommendations
  - Focus on catheter maintenance practices

HICPAC = Healthcare Infection Control Practices Advisory Committee
Trends in Bloodstream Infections among 17 Facilities Participating in CDC Collaborative
Trends in Access-Related BSIs among 17 Facilities Participating in CDC Collaborative

B

Rate per 100 patient-months

Month


54% decrease

- Actual rate
- Modeled rate
- 95% confidence band

a
A Single Collaborative Facility in New Jersey

Reduced Access-Related Bloodstream Infection (ARB) rates from 2.04 → 0.24 per 100 patient-months

Downham, G. et al. MMWR 2012; 61:169-173
FMC Catheter Care Protocol Study

- Implemented & assessed CDC-recommended catheter care practices
  - 2% Chlorhexidine with 70% alcohol for exit site care
  - 70% Alcohol pads for scrubbing end caps and hubs at initiation, termination and any time dialysis lines disconnected

- Facility assignment: 211 intervention group (IG) facilities; 211 continued usual care (UC)


- BSI rates:
  - Baseline period = 0.86/1000 CVC-days
  - Follow-up period = 0.80 (IG) vs. 1.04/1000 CVC-days (UC)

CDC Approach to BSI Prevention in Dialysis Facilities
(i.e., the Core Interventions for Dialysis Bloodstream Infection (BSI) Prevention)

1. Surveillance and feedback using NHSN
   Conduct monthly surveillance for BSIs and other dialysis events using CDCs National Healthcare Safety Network (NHSN). Calculate facility rates and compare rates in other NHSN facilities. Actively share results with front-line clinical staff.

2. Hand hygiene observations
   Perform observations of hand hygiene opportunities monthly and share results with clinical staff.

3. Catheter/vascular access care observations
   Perform observations of vascular access care and catheter accessing quarterly. Assess staff adherence to aseptic technique when connecting and disconnecting catheters and during dressing changes. Share results with clinical staff.

4. Staff education and competency
   Train staff on infection control topics, including access care and aseptic technique. Perform competency evaluation for skills such as catheter care and accessing every 6–12 months and upon hire.

5. Patient education/engagement
   Provide standardized education to all patients on infection prevention topics, including vascular access care, hand hygiene, risks related to catheter use, recognizing signs of infection, and instructions for access management when away from the dialysis unit.

6. Catheter reduction
   Incorporate efforts (e.g., through patient education, vascular access coordinator) to reduce catheters by identifying and addressing barriers to permanent vascular access placement and catheter removal.

7. Chlorhexidine for skin antisepsis
   Use an alcohol-based chlorhexidine (0.5%) solution as the first line skin antiseptic agent for central line insertion and during dressing changes.*

8. Catheter hub disinfection
   Scrub catheter hubs with an appropriate antiseptic after cap is removed and before accessing. Perform every time catheter is accessed or disconnected.**

9. Antimicrobial ointment
   Apply antimicrobial ointment or povidone-iodine ointment to catheter exits sites during dressing changes.***

* Povidone-iodine (preferentially with alcohol) or 70% alcohol are alternatives for patients with chlorhexidine intolerance.
** If closed needleless connector device is used, disinfect device per manufacturer’s instructions.
*** See information on selecting an antimicrobial ointment for hemodialysis catheter exit sites on CDC’s Dialysis Safety website (http://www.cdc.gov/dialysis/prevention-tools/core-interventions.html). Use of chlorhexidine-impregnated sponge dressing might be an alternative.

For more information about the Core Interventions for Dialysis Bloodstream Infection (BSI) Prevention, please visit http://www.cdc.gov/dialysis

1. Surveillance and feedback using NHSN

- Conduct surveillance for BSIs and other dialysis events using CDC’s NHSN
- Calculate facility rates and compare to rates in other NHSN facilities
- Actively share results with front-line clinical staff
2. Hand hygiene observations

Perform monthly hand hygiene audits with feedback of results to clinical staff.
### Audit Tool: Hemodialysis Hand Hygiene Observation

**CDC Dialysis Collaborative**  
*Facility Name: ____________________  Date: _________  Start time: _________ AM / PM*

**Day:** M W F Tu Th Sa  
**Shift:** 1st  2nd  3rd  4th  
**Observer:** ____________________  
**Location within unit:** ____________________

**Audit Tool:** Hemodialysis hand hygiene observations

(Use a "\(\checkmark\)" for each 'hand hygiene opportunity' observed. Under ‘opportunity successful’, use a "\(\checkmark\)" if successful, and leave blank if not successful)

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Hand hygiene</th>
<th>Describe any missed attempts (e.g., during medication prep, between patients, after contamination with blood, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

**Discipline:** P=physician, N=nurse, T=technician, S=student, D=dietitian, W=social worker, O=other

**Duration of observation period — _________ minutes  Number of successful hand hygiene opportunities observed — _________**

**Total number of patients observed during audit — _________  Total number of hand hygiene opportunities observed during audit — _________**

**See hand hygiene opportunities on back page**

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3. Catheter care/vascular access care observations

Perform observations of vascular access care and catheter accessing quarterly.

Assess adherence to aseptic technique when connecting and disconnecting catheters and during dressing changes.

Share results with clinical staff.
# Audit Tool: Catheter Connection and Disconnection Observations

**Audit Tool:** Catheter connection and disconnection observations

(Use a “✓” if action performed correctly, a “✗” if not performed. If not observed, leave blank)

<table>
<thead>
<tr>
<th>Procedure observed,</th>
<th>Discipline</th>
<th>Mask worn properly (if required)</th>
<th>Hand hygiene performed</th>
<th>New clean gloves worn</th>
<th>Catheter removed from blood line aseptically (disconnection only)</th>
<th>Catheter hub scrubbed</th>
<th>Hub antisepsic allowed to dry</th>
<th>Catheter connected to blood lines aseptically (connection only)</th>
<th>New caps attached aseptically (after disconnecting)</th>
<th>Gloves removed</th>
<th>Hand hygiene performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>C:connect D:disconnect</td>
<td>P=physician, N=nurse, T=technician, S=student, O=other</td>
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</tbody>
</table>

Duration of observation period = _______ minutes

Number of procedures performed correctly = _______

Total number of procedures observed during audit = _______

**ADDITIONAL COMMENTS/OBSERVATIONS:**

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4. Staff education and competency

Train staff on infection control topics, including access care & aseptic technique.

Perform competency evaluation for skills such as catheter care and accessing every 6-12 months & upon hire.
Checklists: Hemodialysis Catheter Connection and Disconnection

**Checklist: Hemodialysis catheter connection**

- Wear mask (if required)
- Perform hand hygiene
- Put on new, clean gloves
- Clamp the catheter and remove caps
- Scrub catheter hub with antiseptic
- Allow hub antiseptic to dry
- Connect catheter to blood lines aseptically
- Remove gloves
- Perform hand hygiene

**Checklist: Hemodialysis catheter disconnection**

- Wear mask (if required)
- Perform hand hygiene
- Put on new, clean gloves
- Clamp the catheter
- Disconnect catheter from blood lines aseptically
- Scrub catheter hub with antiseptic
- Allow hub antiseptic to dry
- Attach new caps aseptically
- Remove gloves
- Perform hand hygiene

Infection Prevention in Dialysis Settings

CDC has created a new continuing education course “Infection Prevention in Dialysis Settings” for outpatient hemodialysis healthcare workers, including technicians and nurses.

The 1-hour self-guided training course features a flash-based slide presentation and audio narration. The course reviews the following topic areas:

- Infections that patients can get from dialysis
- Infection control recommendations for outpatient hemodialysis healthcare workers, and
- Educating your patients and their caregivers.

Click here to launch the course: Launch Course Now*
* JavaScript must be enabled

Download the Infection Prevention in Dialysis Settings (PPT - 12.15 MB)

If you want to receive Continuing Education for completing the course, you must complete a course assessment and evaluation using the Centers for Disease Control and Prevention (CDC) Training and Continuing Education Online (TCEOnline) system. You may access the system at:

www.cdc.gov/TCEOnline.
5. Patient education/engagement

Provide standardized education to all patients on infection prevention topics including:

- Vascular access care
- Hand hygiene
- Risks related to catheter use
- Recognizing signs of infection
- Instructions for access management when away from the dialysis unit
6. Catheter reduction

Pursue efforts (e.g., through patient education, vascular access coordinator) to reduce catheters by identifying and addressing barriers to permanent vascular access placement and catheter removal.
7. Chlorhexidine for skin antisepsis

Use an alcohol-based chlorhexidine (>0.5%) solution as the first line skin antiseptic agent, for central line insertion and during dressing changes.

Povidone-iodine, preferably with alcohol, or 70% alcohol are alternatives for patients with chlorhexidine intolerance.
8. Catheter hub disinfection

Scrub catheter hubs with an appropriate antiseptic after the cap is removed and before accessing.

Perform every time catheter is accessed or disconnected.

If closed needleless connector device is used, disinfect per manufacturer’s instructions.
Scrub-the-Hub Protocol

Hemodialysis Central Venous Catheter Scrub-the-Hub Protocol

This protocol outlines a suggested approach to preparing catheter hubs prior to accessing the catheter for hemodialysis. It is based on evidence where available and incorporates theoretical reasons when published evidence is unavailable.

Definitions:
- Catheter refers to a central venous catheter (CVC) or a central line.
- Hub refers to the end of the CVC that connects to the blood line or cap.
- Cap refers to a device that screws on to and occludes the hub.
- Lines refers to the catheter portion that extends from the patient’s body to the hub.
- Blood lines refer to the arterial and venous ends of the extracorporeal circuit that connect the patient’s catheter to the dialyzer.

Catheter Connection and Disconnection Steps:

Connection Steps:
1. Perform hand hygiene and don new clean gloves.
2. Clamp the catheter. (Note: Always clamp the catheter before removing the cap. Never leave an uncapped catheter unattended.)
3. Disfect the hub with caps removed using an appropriate antiseptic (see note).
4. (Optional) Prior to cap removal, disfect the cap and then the part of the hub that’s accessible and discard the antiseptic pad (i.e., use a separate antiseptic pad for each step).
5. Remove the cap and disinfect the hub with a new antiseptic pad for each hub. Scrub the sides (threads) and end of the hub thoroughly with friction, making sure to remove any residue (e.g., blood).
6. Using the same antiseptic pad, apply antiseptic with friction to the catheter, moving from the hub to at least several centimeters towards the body fluid. Rub the hub while applying the antiseptic to dry.
7. Use a separate antiseptic pad for each hub catheter limb. Leave hub cap open (i.e., unclamped and disconnected) for the shortest time possible.

Disconnection Steps:
1. Always handle the catheter hubs aseptically. (Once disinfected, do not allow the catheter hubs to touch nonsterile surfaces.
2. Attach sterile syringes, unclamp the catheter, withdraw blood, and flush per facility protocol.
3. Remaining for other limbs (this might occur in parallel).
4. Connect the ends of the blood lines to the catheter aseptically.
5. Remove gloves and perform hand hygiene.

Notes/Discussion:

Antiseptic Use and Selection
As described in the 2011 CDC/Hospital Infection Control Practices Advisory Committee (HICPAC)/Guidelines for the Prevention of Intravascular Catheter-Related Infections, prior to accessing the catheter hub, it should be disinfected with an appropriate antiseptic greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine. There is not enough evidence to recommend one antiseptic over the others. Generally, antiseptics should be allowed to dry for maximal effect.

Using 70% alcohol, sterile antiseptic pads should be used (i.e., sterile tape over the needle and plunger for non-sterile catheters). If not, the pad is sterile or non-sterile. For practical reasons, pads or similar products must be performed on other forms of antiseptics (e.g., iodophors) for disinfecting the catheter as they are more feasible and do not require repeated cleaning of small spaces. If using an antiseptic that leaves a residue (e.g., chlorhexidine), avoid allowing large amounts of antiseptic to enter the lumen of the catheter to avoid potential toxicities to the patient.

Sealing Caps
The role of sealing caps in an antiseptic prior to removing the hub is not clear. It is not a CDC/HICPAC recommendation. This procedure is described in the 2000 National Kidney Foundation’s Kidney Disease Outcomes Quality Initiative (KDQI) Vascular Access Guidelines but was not included in the 2006 update.

Handling Catheter Hubs
Catheter hubs should always be handled aseptically. Once disinfected, the catheter hubs should not be allowed to touch nonsterile surfaces. This might be best performed by holding them until the antiseptic dries. During this time, the staff member performing the procedure should also ensure that the catheter remains clamped.

Bloodline Disconnection
When disconnecting the line, disconnecting the ends of the blood lines is not required if care has been taken to prevent contamination of the ends of the blood lines (i.e., through careful aseptic technique. Blood lines can be constantly disinfected during connections and disconnections, as well as during the priming process. Contact with contaminated manufacturing processes in prime should be avoided. Disconnecting the bloodlines does address this issue.

Disconnection and Line Reinsertion
Catheter hubs should be disinfected again after disconnecting from bloodlines and before replacing a new cap at the end of a treatment. This should be done in a manner similar to that used when disinfecting the hub prior to accessing. Disinfecting the catheter hub and the end of the extracorporeal blood line should also be performed after initiating a treatment. A patient must be disconnected and then blood line re-circulated. Anytime a patient’s catheter is disconnected, the patient should be done aseptically and the number of times a patient’s catheter is disconnected from the blood line should be minimized to the extent possible.

Securing Caps with Tape
Tape can be used to secure the caps on to hubs between treatments. Tape can be removed on the hubs that might make disinfecing them more difficult.

Use of Masks
Although data supporting the use of masks during catheter access/ disconnecting to prevent vascular access infections is lacking, this practice is recommended for patients and staff in the 2000 KDQI guidelines and is included in the Centers for Medicare and Medicaid Services (CMS) End Stage Renal Disease Program Conditions for Coverage Interpretive Guidance.

Personal Protective Equipment (PPE)
Proper PPE should always be worn by staff to avoid exposure to potentially infectious blood and body fluids when connecting/desealing catheters.

Aspiration Technique
This includes practices that prevent the contamination of clean sterile items and surfaces. Once tasks requiring negative pressure have been started, care must be taken to avoid contamination of gloves and other sterile items that can occur when touching dirty surfaces (e.g., positioning patient, using computer keyboard).

Selected References:

Scrub-the-Hub Basics - 1

- For facilities that use dead-end caps to cover the catheter hub
  - The catheter hubs should be *scrubbed* with antiseptic *after* removing the cap and before connecting to bloodlines
  - Do the same during disconnection before attaching new caps
  - Note, soaking or wiping the hub with the cap still attached does not effectively address intraluminal contamination

For more information, see CDC’s Scrub-the-Hub protocol

Scrub-the-Hub Basics - 2

- For facilities that use closed connector devices
  - Follow process similar to above when changing connectors*
  - In between changes, scrub the access port with antiseptic before accessing*

- For all facilities
  - Use a sterile antiseptic pad

* Follow manufacturer’s instructions
Scrub-the-Hub Protocol

Hemodialysis Central Venous Catheter Scrub-the-Hub Protocol

This protocol outlines a suggested approach to preparing catheter hubs prior to accessing the catheter for hemodialysis. It is based on evidence where available and incorporates internal controls when published evidence is unavailable.

Definitions:
- Catheter refers to a central venous catheter (CVC) or a central line.
- Hub refers to the end of the catheter that connects to the blood lines or cap.
- Cap refers to a device that screws onto the hub and occludes the catheter.

Blood lines refer to the arterial and venous ends of the extracorporeal circuit that connect the patient’s catheter to the dialyzer.

Catheter Connection and Disconnection Steps:
- **Connection Steps:**
  1. Perform hand hygiene and don new clean gloves.
  2. Clamp the catheter (not always clamp the catheter before removing the cap; never leave an uncapped catheter unintended).
  3. Disinfect the hub with caps removed using an appropriate antiseptic (see notes).
- **Disconnection Steps:**
  1. Perform hand hygiene and don new clean gloves.
  2. Clamp the catheter (not always clamp the catheter before removing the cap; never leave an uncapped catheter unintended).
  3. Disinfect the catheter hub before applying the new cap using another antiseptic (see notes).

Note:
- **(Optional) Disinfect the connection prior to disconnection.** If this is done, use a separate antiseptic pad for the subsequent disinfection of the hub.

- **(Optional) Prior to cap removal, disinfect the cap before disinfecting the hub.** Use a sterile antiseptic pad for each step.
- **(Optional) Use a sterile antiseptic pad for each hub.** (See steps 3 and 4 in the original protocol.)

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Notes/Discussion:
- **Antiseptic Use and Selection:**
  - As described in the 2011 CDC/Healthcare Infection Control Practices Advisory Committee (HICPAC) Guidelines for the Prevention of Intravascular Catheter-Related Infections, prior to accessing the catheter hub, it should be disinfected with an appropriate antiseptic greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine. There is not enough evidence to recommend one antiseptic over the other. Generally, antiseptics should be allowed to dry for 30-60 seconds.

- **Antiseptic Technique:**
  - Using the same antiseptic pad, apply antiseptic with friction to the catheter, moving from the hub at least several centimeters towards the body fluid exit limb, allowing the antiseptic to dry.
  - (Use a separate antiseptic pad for each hub.)

- **Antiseptic Technique:**
  - (Use a separate antiseptic pad for each hub.)

- **Bloodline Disinfection:**
  - When disinfecting the end of the blood lines, it is recommended to first clean the catheter hub with an appropriate antiseptic (see above).
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  - When disinfecting the end of the blood lines, it is recommended to first clean the catheter hub with an appropriate antiseptic (see above).
  - **Bloodline Disinfection:**
  - When disinfecting the end of the blood lines, it is recommended to first clean the catheter hub with an appropriate antiseptic (see above).

References:
9. Antimicrobial ointment

Apply antibiotic ointment or povidone-iodine ointment to catheter exit sites during dressing change.

Info on selecting an antimicrobial ointment on CDC website.

Chlorhexidine-impregnated sponge dressing might be an alternative.
Patients who undergo dialysis treatment have an increased risk for getting a healthcare-associated infection (HAI). Hemodialysis patients are at a high risk for infection because the process of hemodialysis requires frequent use of catheters or insertion of needles to access the bloodstream. Also, hemodialysis patients have weakened immune systems, which increase their risk for infection, and they require frequent hospitalizations and surgery where they might acquire an infection.

http://www.cdc.gov/dialysis/
Training Video and Print Resources

For Preventing Bloodstream and Other Infections in Outpatient Hemodialysis Patients

CDC has created a video for frontline dialysis staff along with an accompanying poster for staff and pocket card for patients that convey best practices for preventing bloodstream and other infections in hemodialysis outpatients. Below is a brief description of each material:

Provider Training Video:
Preventing Bloodstream Infections in Outpatient Hemodialysis Patients: Best Practices for Dialysis Staff

This video contains five segments with best practices on how to prevent infection in patients with catheters, fistulas or grafts. It also includes segments on hand hygiene and glove use and dialysis station disinfection. The video is about 11 minutes long.

YouTube link: Preventing Bloodstream Infections in Outpatient Hemodialysis Patients: Best Practices for Dialysis Staff

Order DVD [Coming Soon]
Patient Guide

Patients with Catheters

TIP 1: Catheters have a higher risk of infection. Ask your doctor about getting a fistula or graft instead.

TIP 2: Learn how to take care of the catheter at home. Do not get it wet.

TIP 3: Wash your hands often, especially before and after dialysis treatment.

TIP 4: Know the steps your healthcare providers should take when using the catheter for treatment.

TIP 5: Know the signs and symptoms of infection and what to do if you think you might have an infection.

TIP 6: Know what to do if you have any problem with the catheter.

PUT TOGETHER THE PIECES TO PREVENT INFECTIONS IN DIALYSIS PATIENTS

Engage Patients
Discuss important infection prevention practices like hand hygiene with your patients and their caregivers.

Reduce Catheters
Identify and address barriers to timely removal of catheters at the end of treatment.

Perform Hand Hygiene and Change Gloves
Know when it is necessary to perform hand hygiene and change your gloves, put this knowledge into practice.

Catheter Care; Scrub the Hubs
Scrub the catheter hub and allow them to air dry. Use alcohol wipe with a cloth at the catheter exit site and apply an antimicrobial treatment.

Vacinate Dialysis Staff and Patients
Make sure staff and patients are up-to-date for influenza and hepatitis A vaccinations and patients have received pneumococcal vaccination.

Disinfect the Dialysis Station
Ensure the station is empty before disinfecting visible surfaces with an disinfectant.

Track Infections
Know your facility’s areas for important infections like access site and bloodstream infections.

Follow Safe Injection Practices
Never reuse needles or syringes or administer medications from a single-dose vial or IV bag to multiple patients. Use single-dose vials whenever possible and dispose of them immediately after use.

Use aseptic technique
Take care to not contaminate the access, bloodstream or hemodialysis circuit. Scrub injection ports prior to use.

Video Clip
Summary

• BSI prevention is possible
  – Reductions of 30-50%

• Many resources available
  – Audit tools, checklists, protocols
  – Free continuing education course

• Familiarize yourself with CDC’s recommended interventions
  – Assess & improve practices in your facility
  – Make sure optimal catheter care is part of this plan
Thanks!

http://www.cdc.gov/dialysis/

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333
Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov Web: www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.
<table>
<thead>
<tr>
<th>Questions</th>
<th>Results</th>
<th>Bar Graph</th>
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<tbody>
<tr>
<td>1. Are you familiar with CDC...</td>
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<td></td>
</tr>
<tr>
<td>a. Yes</td>
<td>21/31(68)</td>
<td></td>
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<tr>
<td>b. No</td>
<td>0/31(0)</td>
<td></td>
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<tr>
<td>No Answer</td>
<td>10/31(32)</td>
<td></td>
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<td>2. Are you using the interven...</td>
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<tr>
<td>a. Yes, using all or most...</td>
<td>19/31(61)</td>
<td></td>
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<tr>
<td>b. No, using few or no</td>
<td>0/31(0)</td>
<td></td>
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<tr>
<td>c. Don’t know</td>
<td>2/31(6)</td>
<td></td>
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<tr>
<td>No Answer</td>
<td>10/31(32)</td>
<td></td>
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<td>3. Do you think catheter car...</td>
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<td></td>
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<tr>
<td>a. Yes</td>
<td>21/31(68)</td>
<td></td>
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<tr>
<td>b. No</td>
<td>0/31(0)</td>
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