Infection Prevention:
Improving Outcomes, Saving Lives

CDC Trial: Station Disinfection

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No Financial Disclosures

Learning Objectives

1. Identify the potential cross-contamination risks for in-center hemodialysis patients.
2. Discuss CDC checklists, audit tools and resources available to dialysis units.
3. Examine barriers and explore strategies for making changes to disinfection practices.
4. Present three positive outcomes from implementation of new station disinfection process.

Dialysis Patients & Setting

- ~ 380,000 maintenance hemodialysis patients
- ~ 5,700 outpatient dialysis facilities
  - Only 10% are hospital-affiliated
  - 85% are for-profit
  - 60% belong to a large dialysis organization (LDO)
- Unique challenges to infection prevention
  - Shared patient treatment setting
  - Frequent treatments (3 times a week)
  - Financial pressures

Burden of Healthcare-Associated Infections (HAI's)

- CDC Vital Signs report: Central line-associated BSI's [1]
  - Inpatient ICU's: ~ 42,000 estimated
  - Outpatient hemodialysis: ~ 37,000 estimated
- Infection is the 2nd leading cause of death in dialysis
- Hospitalization rates have increased 40% in past 20 years
  - BSI cost per hospitalization ~$23,000
- 21 % of all invasive methicillin-resistant *Staphylococcus aureus* (MRSA) infections
  - Incidence > 100 times that of the general population
- Hepatitis C virus (HCV infection)
  - Prevalence in dialysis patients ~ 8-10%

1. CDC: MMWR 2011 60(08): 243-248 . 2. CDC: MMWR 2007; 56(09) 197-199

2013 CDC Recommendation:

New Protocol for Environmental Disinfection

- Why is it Important?

Hepatitis C

- **Hepatitis C- total 16 outbreaks (2008-2012):**
  - 160 outbreak-associated cases, >90,000 at-risk persons notified for screening.
  - 6 outbreaks occurred in hemodialysis settings, with 50 outbreak-associated cases of HCV and 1,353 persons notified for screening.
- **How long does the Hepatitis C virus survive outside the body?**
  - The Hepatitis C virus can survive outside the body at room temperature, on environmental surfaces, for at least 16 hours but no longer than 4 days.

Hepatitis C Outbreaks

Hemodialysis	YR	State	Persons Notified for Screening	Outbreak-Associated Infections	Known or suspected mode of transmission[4]	Comments
Outpatient dialysis center	2012	CA	42	4	Specific lapses in infection control not identified at the time of the investigation	
Outpatient hemodialysis facility	2011	GA	89	6	Failure to maintain separation between clean and contaminated workspaces	
Outpatient hemodialysis facility	2010	TX	171	2	Specific lapses in infection control not identified at the time of the investigation	
Outpatient hemodialysis facility	2009	MD	250	8	Breaches in medication preparation and administration practices Breaches in environmental cleaning and disinfection practices	
Hospital-based outpatient hemodialysis facility	2009	NJ	144	21	Breaches in medication preparation and administration practices Breaches in environmental cleaning and disinfection practices	All patients who received dialysis in this facility since 2005 were notified for screening
Outpatient hemodialysis facility	2008	NY	657	9	Failure to consistently change gloves and perform hand hygiene between patients. Breaches in environmental cleaning and disinfection practices	All patients who received dialysis in this facility since 2004 were notified for screening
Totals			1353	50		

- Healthcare-Associated Hepatitis B and C Outbreaks Reported to the Centers for Disease Control and Prevention (CDC) in 2008-2012

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Common Themes from Outbreaks

- Patient overlaps in space and time (i.e., transmission from)
  - One patient to the next at the same station
  - One patient to another at adjacent stations
- Breaches in medication preparation and administration practices
  - Preparing medications in potentially contaminated areas
  - Mobile medication carts
  - Not wiping injection ports prior to accessing
- Breaches in environmental cleaning and disinfection practices
  - Surfaces wiped down with patient still at station
  - Rushed turnover processes

Lack of Physical Barriers or Meaningful Separation Between Stations

- Where does one station end and another begin?

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Challenges to Proper Environmental Disinfection

- No physical barrier between stations
- Frequent blood contamination of surfaces
- Staff feeling pressured to turnover stations quickly
- Multi-tasking
  - Easy to miss surfaces, even entire stations
  - Re-contamination of cleaned surfaces
- Shared computer charting stations within treatment stations
- Difficult to clean high-touch surfaces, e.g. keyboards

STUDY: Vancomycin-resistant Enterococci (VRE) Contamination in Hemodialysis

- Australian study assessed VRE contamination in several outpatient settings, including hemodialysis
  - 7 patients & 15 healthcare personnel (HCP) took part in 26 hemodialysis sessions
  - Patients were VRE-colonized and fecally continent
  - Cultured various surfaces after treatment session
    - Ensured all surfaces were free of contamination pre-treatment.

Grabsch et al, Infect Control Hosp Epidemiol 2006; 27:287-293

Results: VRE Contamination Rate

SITE/ SURFACE	% of sessions with VRE detected
Dialysis treatment chair	58%
HCP gown	30%
Patient ungloved hands	54%
Stethoscope	8%
Blood pressure monitor	11%
Dialysis machine	4%
HCP gloved hands	8%
HCP ungloved, cleaned hands	8%

Continent patients – do they contaminate the environment?

The results for chair, gown, and patient hands suggest they DO!

Grabsch et al, Infect Control Hosp Epidemiol 2006; 27:287-293

STUDY: Inspired by CSI

- After a cluster of new HCV infections identified in hemodialysis unit in Netherlands
  - Strict infection control measures were instituted
  - Wanted to assess the role of environmental contamination
  - Used forensic luminol to detect residual blood on surfaces in the unit.

Application of the forensic Luminol for blood in infection control☆

P.W.M. Bergervoet*, N. van Riessen, F.W. Sebens, W.C. van der Zwet

Department of Medical Microbiology and Infection Control, Deventer Ziekenhuis, Deventer, The Netherlands

Bergervoet P. J Hosp Infect 2008; 68:323-333

Widespread Luminescence/ Contamination Identified

Bergervoet P. J Hosp Infect 2008; 68:323-333

High-Touch Surfaces

- No visible blood before luminal

Bergervoet P. J Hosp Infect 2008; 68:323-333

Other Areas of Luminescence

- Hemodialysis machines & syringe pump: areas most frequently touched by fingertips were most contaminated
- Lid of laundry container: places touched by hands
- Telephone and computer keyboard: keys were contaminated

Bergervoet P. J Hosp Infect 2008; 68:323-333

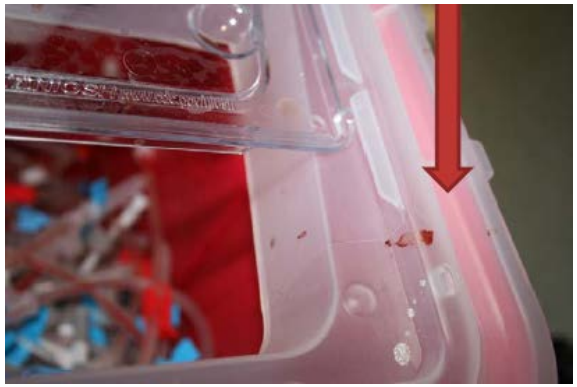
STUDY: CDC Attempt to Replicate Luminol Study using a Hemoglobin Assay

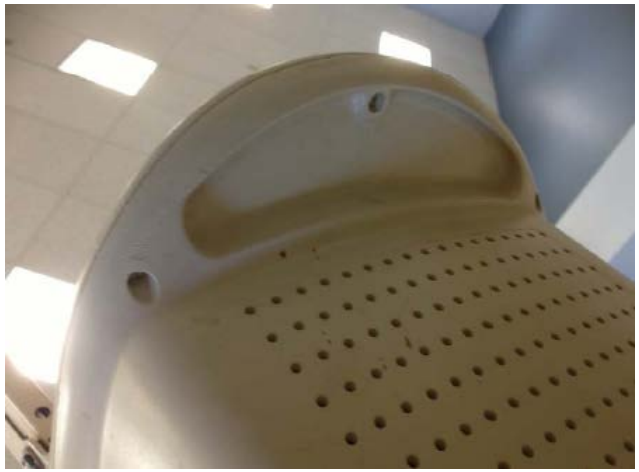
- Bluestar Forensic and Hexagon OBTI to identify hemoglobin
- Sampling was done on:
  - 2 Dialysis Machines
  - 1 Dialysis patient chair
  - 2 chairs in waiting room
  - Door handle of rest room
  - Bottom surface of patient TV
  - Biohazard trash bin
  - Face shields

Nguyen, D et al. CDC Unpublished Data 2013

CDC Results

Site	Visible blood stain	Hemoglobin test
Biohazard waste bin	+	+
Side of machine, close to BP cuff	+	+
Dialysis Chair side of table	-	+
Waiting area chair arm rest	-	+
Bottom of TV in dialysis station	-	+





- Nguyen, D et al. CDC Unpublished Data 2013

Why a clean environment??

- Surfaces are contaminated !
- Patients are put at risk of infection!!
  - Hepatitis C
  - Hepatitis B
  - MRSA
  - VRE
  - *C. difficile*
  - Influenza

- We need to do a better Job!!

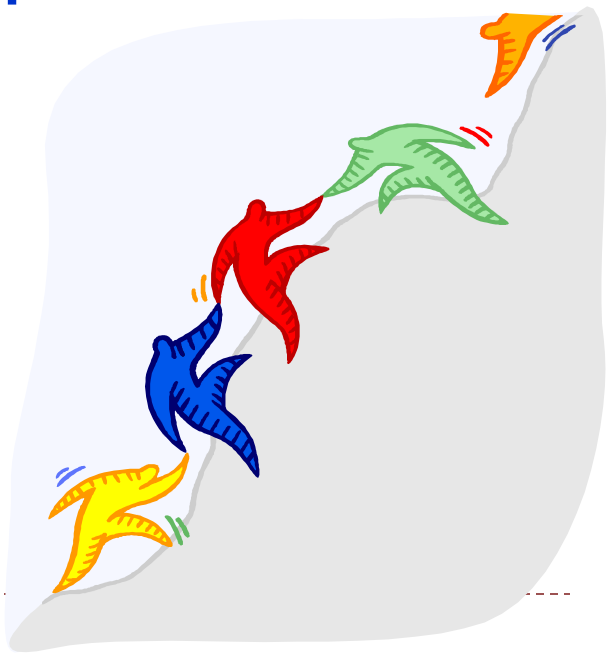
BOTTOM LINE


S.O.S.

CDC to the Rescue

CDC Dialysis BSI Prevention Collaborative

- Inception in 2009 – with 17 units
- Has since grown to include ??
- Goal of CDC:
  - Collaborative approach to infection prevention
  - Demonstrate preventability
  - Measure infection rates – NHSN
  - Intervention packages



The collaborative approach leads to interactions that facilitate the recognition and dissemination of good ideas between participants.

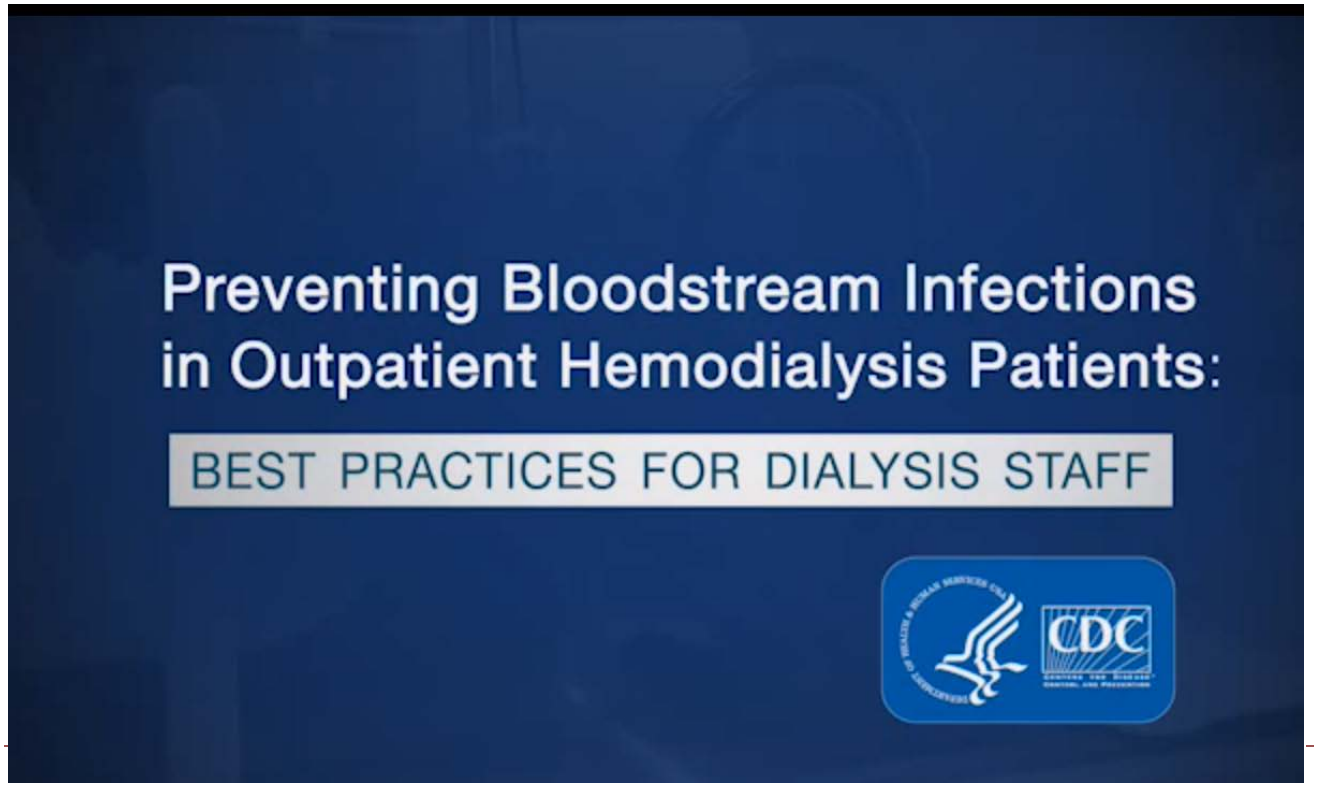
Dialysis Resource Site

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

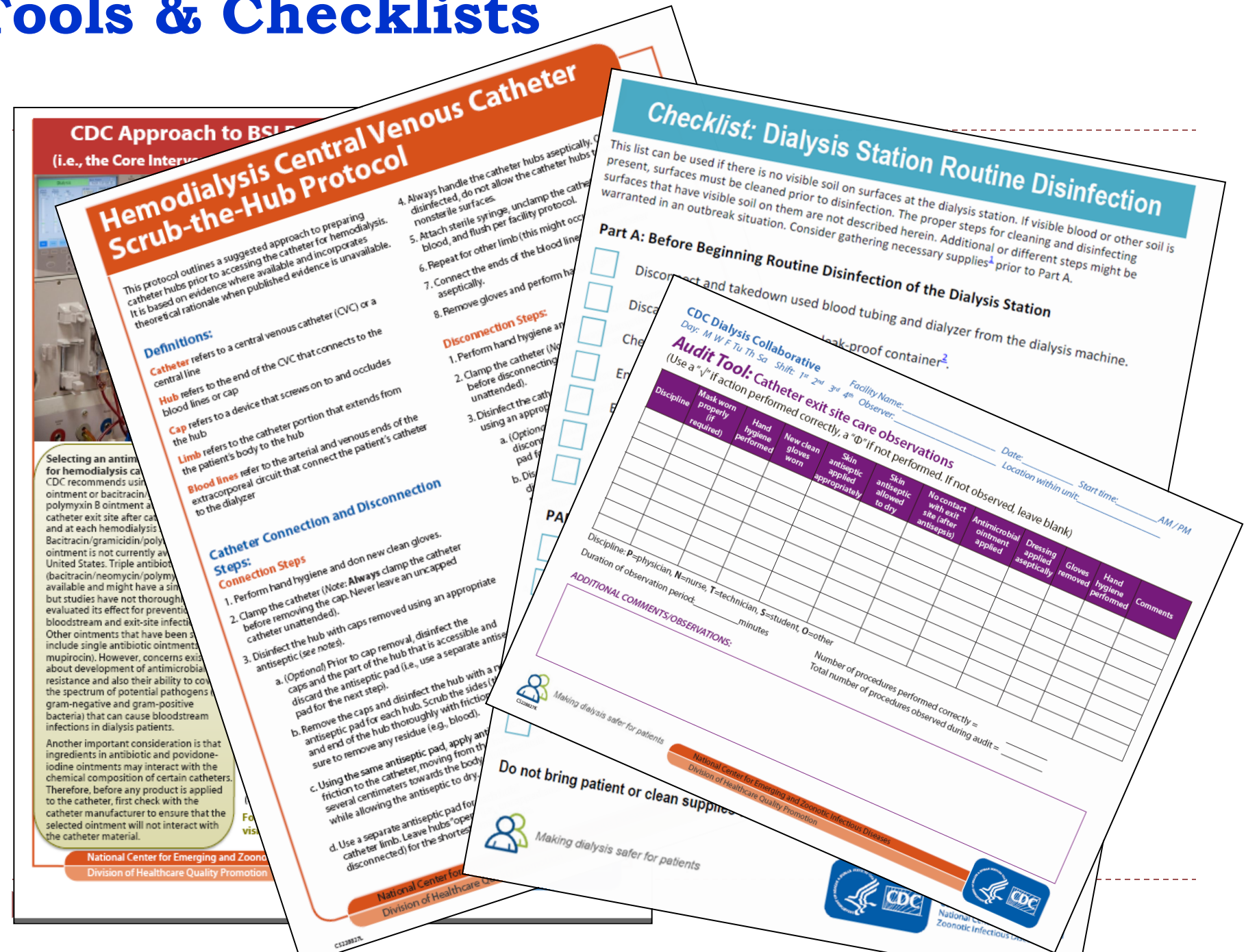
Preventing Bloodstream Infections in Outpatient Dialysis Centers: Best Practices for Dialysis Staff

- Hand hygiene and glove use
- Vascular access care
- Disinfection of station

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



Tools & Checklists



CDC Approach to BSI

(i.e., the Core Interv

Selecting an antim
for hemodialysis ca
CDC recommends usir
ointment or bacitracin/
polymyxin B ointment a
catheter exit site after cat
and at each hemodialysis
Bacitracin/gramicidin/poly
ointment is not currently av
United States. Triple antibiot
(bacitracin/neomycin/polym
available and might have a sin
but studies have not thorough
evaluated its effect for preventi
bloodstream and exit-site infecti
Other ointments that have been
include single antibiotic ointments
mupirocin). However, concerns exis
about development of antimicrobia
resistance and also their ability to co
the spectrum of potential pathogens
gram-negative and gram-positive
bacteria) that can cause bloodstream
infections in dialysis patients.

Another important consideration is that ingredients in antibiotic and povidone-iodine ointments may interact with the chemical composition of certain catheters. Therefore, before any product is applied to the catheter, first check with the catheter manufacturer to ensure that the selected ointment will not interact with the catheter material.

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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 rationale 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 lines or cap

Cap refers to a device that screws on to and occludes the hub

Limb 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. Disinfect the hub with caps removed using an appropriate antiseptic (*see notes*).
   a. (*Optional*) Prior to cap removal, disinfect the caps and the part of the hub that is accessible and discard the antiseptic pad (i.e., use a separate antise pad for the next step).
   b. Remove the caps and disinfect the hub with a n antiseptic pad for each hub. Scrub the sides (and end of the hub thoroughly with friction sure to remove any residue (e.g., blood).
   c. Using the same antiseptic pad, apply ant friction to the catheter, moving from th several centimeters towards the body while allowing the antiseptic to dry.
   d. Use a separate antiseptic pad fo catheter limb. Leave hubs "ope disconnected) for the shorte
4. Always handle the catheter hubs aseptically. disinfected, do not allow the catheter hubs nonsterile surfaces.
5. Attach sterile syringe, unclamp the cathe blood, and flush per facility protocol.
6. Repeat for other limb (this might occ
7. Connect the ends of the blood line aseptically.
8. Remove gloves and perform ha

Disconnection Steps:

1. Perform hand hygiene an
2. Clamp the catheter (No before disconnecting unattended).
3. Disinfect the cath using an appro
   a. (Option disconn pad f
   b. Dis d

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Division of Healthcare

CS228827L

Checklist: Dialysis Station Routine Disinfection

This list can be used if there is no visible soil on surfaces at the dialysis station. If visible blood or other soil is present, surfaces must be cleaned prior to disinfection. The proper steps for cleaning and disinfecting surfaces that have visible soil on them are not described herein. Additional or different steps might be warranted in an outbreak situation. Consider gathering necessary supplies[1] prior to Part A.

Part A: Before Beginning Routine Disinfection of the Dialysis Station

- Disconnect and takedown used blood tubing and dialyzer from the dialysis machine.
- Disca
- Che
- En
- F

PA

Do not bring patient or clean supplie

Making dialysis safer for patients

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CDC Dialysis Collaborative

Day: M W F Tu Th Sa Shift: 1st 2nd 3rd 4th Facility Name: _____ Observer: _____ Date: _____ Start time: _____ AM / PM Location within unit: _____

Audit Tool: Catheter exit site care observations

(Use a "√" if action performed correctly, a "0" if not performed. If not observed, leave blank)

Discipline	Mask worn properly (if required)	Hand hygiene performed	New clean gloves worn	Skin antiseptic applied appropriately	Skin antiseptic allowed to dry	No contact with exit site (after antisepsis)	Antimicrobial ointment applied	Dressing applied aseptically	Gloves removed	Hand hygiene performed	Comments

Discipline: **P**=physician, **N**=nurse, **T**=technician, **S**=student, **O**=other

Duration of observation period: _____ minutes

Number of procedures performed correctly = _____

Total number of procedures observed during audit = _____

ADDITIONAL COMMENTS/OBSERVATIONS:

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Division of Healthcare Quality Promotion

CASE STUDY – Station Disinfection

The CDC asked for steering committee volunteers to trial a proposed environmental cleaning protocol and checklist.

Goals:

- **To decrease the potential for cross-contamination.**
- **To evaluate the feasibility of the protocol.**
- **To assess how much additional time it would take to perform the new routine.**
- **To recommend a "best practice".**

The challenge

"Not so bad,
same as we usually do except;

Waiting for the patient to leave before disinfection."

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Part A: Before Beginning Routine Disinfection of the Dialysis Station

- ☐ Disconnect and takedown used blood tubing and dialyzer from the dialysis machine.
- ☐ Discard tubing and dialyzers in a leak-proof container[2].
- ☐ Check that there is no visible soil or blood on surfaces.
- ☐ Ensure that the priming bucket has been emptied[3].
- ☐ Ensure that the patient has left the dialysis station[4].
- ☐ Discard all single-use supplies. Move any reusable supplies to an area where they will be cleaned and disinfected before being stored or returned to a dialysis station[5].
- ☐ Remove gloves and perform hand hygiene.

PART B: Routine Disinfection of the Dialysis Station – AFTER patient has left station

- ☐ Wear clean gloves.
- ☐ Apply disinfectant[6] to all surfaces[7] in the dialysis station using a wiping motion (with friction). -
- ☐ Ensure surfaces are visibly wet with disinfectant. Allow surfaces to air-dry[8]. -
- ☐ Disinfect all surfaces of the emptied priming bucket[3]. Allow the bucket to air-dry before reconnection or reuse. -
- ☐ Keep used or potentially contaminated items away from the disinfected surfaces. -
- ☐ Remove gloves and perform hand hygiene.

Do not bring patient or clean supplies to station until these steps have been completed.

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The Trial

- **Engaging the Staff**
  - How we got "by-in"

- **Staff compared the current disinfection practice against the CDC checklist**
- **Emphasized the fact that not much was different**
- **Explored/discussed possible impact on "turnover" flow**
- **ANM promised support during the process**
- **Discussed impact feedback to CDC would have**
- **Last step was to discuss with patients**

Trial – is it working?

- Initially the change in workflow was very challenging.
  - Staff felt as though they were wasting time and should be doing something with the empty machine.
  - Shift turnover was extended by 10-15 min per shift with an overall increase of ~ 20-30 min for the day.
  - What if patient needs to stay longer? … if patients required prolonged post care, they were moved out of the station and into a designated “holding area”.
  - Some patients complained about the delay… Safety of process was re-emphasized with them.

Trial – is it working? yup

- As the week progressed, staff realized that this "wait period" actually had beneficial effects
  - Staff didn't feel rushed to have everything done before the patient left the station.
  - Technicians were able to slow down, and mentally collect their thoughts before moving on to the next patient
  - Documentation was completed
  - The risk of cross-contamination while taking the current patients final blood pressure was eliminated.
    - Prior practice required hand hygiene and gloves before pushing the button on the "just cleaned ready for the next patient" machine for the blood pressure cuff to inflate

Trial Outcome - highlights

- At the end of a 2 week trial, the staff actually requested that they continue with the CDC practice
- Once staff acquired a rhythm, patient schedules were actually minimally impacted (5 -10 min/day in a 3 shift day)
- Staff had more time to “visit” with the patient, which in turn resulted in greater patient AND staff satisfaction.
- We have since rolled this change out to our other 5 satellite units in the state with similar results.
- The staff was very proud to be part of a study that would ultimately help develop safer patient care protocols nationwide.

The take away for other dialysis units

Expect resistance

2.5% innovators
13.5% early adopters
34% early majority
34% late majority
16% are lagers

EDUCATE UP FRONT

BEST FOR THE PATIENT

Not a real difference in current practice

Get a champion

Look for the rewards

Something to think about

- *YOU* make the difference in your unit…
  - for the **PATIENT**
  - for the other **STAFF**
  - for your **FAMILY**
  - for your **COMMUNITY**
  - for **YOU**
- **What will you do when you get back ?**
  - **Talk to one person about something you heard today**
  - **Be open to new ideas**
  - **Make a commitment to change one thing YOU do**

REMEMBER

YOU

ARE THE DIFFERENCE

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