

*Infection Prevention:
Improving Outcomes, Saving Lives*

Hemodialysis: Prevention of Healthcare-associated Infections

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Objectives

1. Provide an overview of the risks of infection for hemodialysis patients.
2. Describe current CDC recommended practices for prevention of infections in hemodialysis.



BACKGROUND: Dialysis, Infection Prevention & the Culture of Safety

McCoy: *What's the matter with you?*

Elderly Patient: *Kidney dialysis.*

McCoy: *Dialysis? My God. What is this, the dark ages? Here. Now, you swallow that. If you have any problems, just call me.*

Imagine; a pill which completely cures her in minutes. Decades of progressive degeneration, erased in minutes with a pill!



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



Background –

The National Picture



1 in 20

Two small orange icons of a man and a woman are positioned to the right of the text.

About 1 in 20 patients gets an infection each year while receiving medical care.



41,000

About 41,000 bloodstream infections strike hospital patients with central lines each year.



37,000

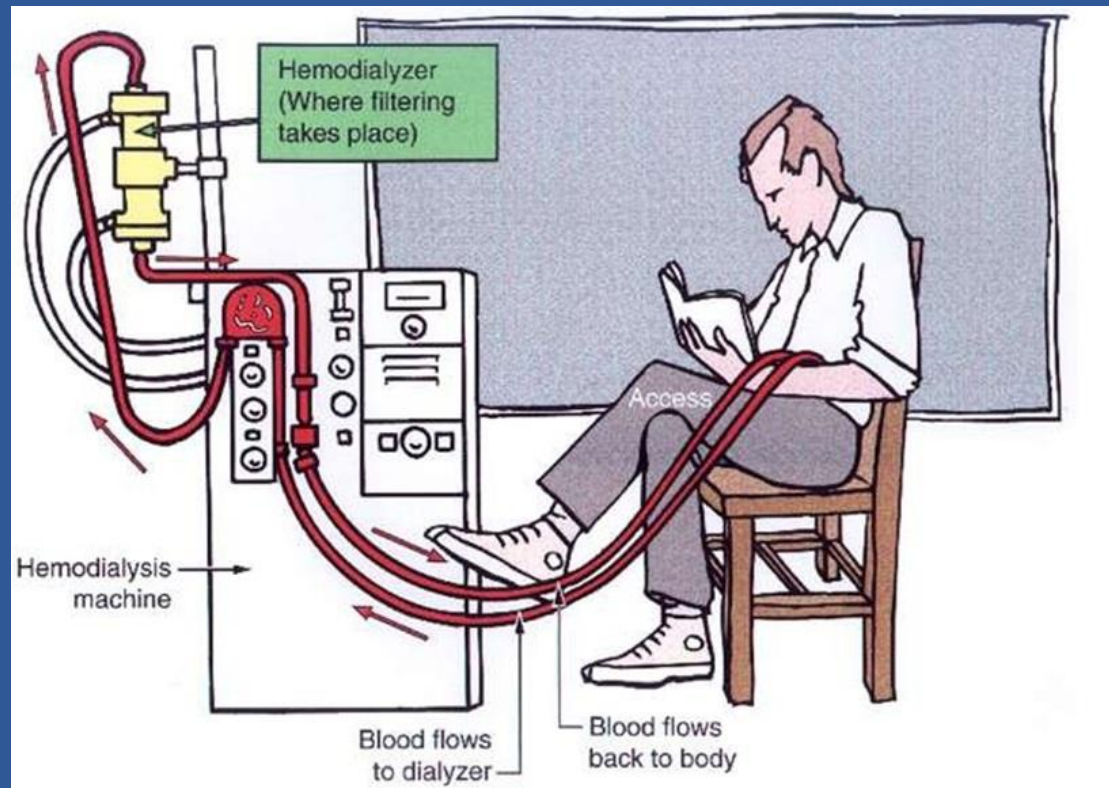
About 37,000 bloodstream infections happen each year to kidney dialysis patients with central lines.

- ▶ 2011 CDC Vital Signs report: Central line-associated BSI's
 - ▶ Hospital Inpatient's: ~ 41,000 estimated
 - ▶ Outpatient hemodialysis: ~ 37,000 estimated
 - ▶ Attributable mortality: 12-25%
 - ▶ Cost: \$3,700 – \$28,000 per episode
 - **CDC Vital Signs: Making Health Care Safer: Reducing Bloodstream Infections** March 2011
 - USRDS 2012 Annual Report
-

Burden of Healthcare-Associated Infections (HAI's)

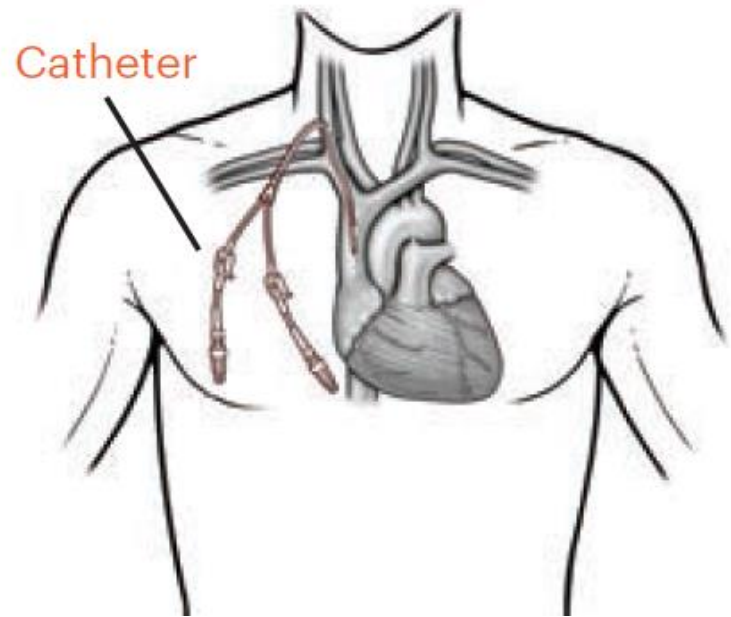
- ▶ Infection is the 2nd leading cause of death in dialysis
- ▶ Hospitalization rates have increased 40% in past 20 years
- ▶ Invasive methicillin-resistant *Staphylococcus aureus* (MRSA) infections ²
 - ▶ Incidence > 100 times that of the general population
- ▶ Hepatitis C virus (HCV infection)
 - ▶ Prevalence in dialysis patients ~ 8-10%

The Patient & Procedure



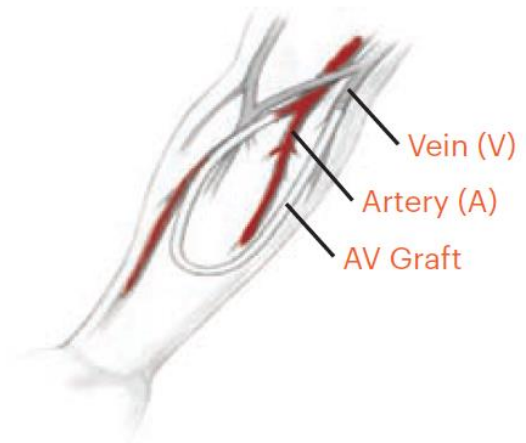
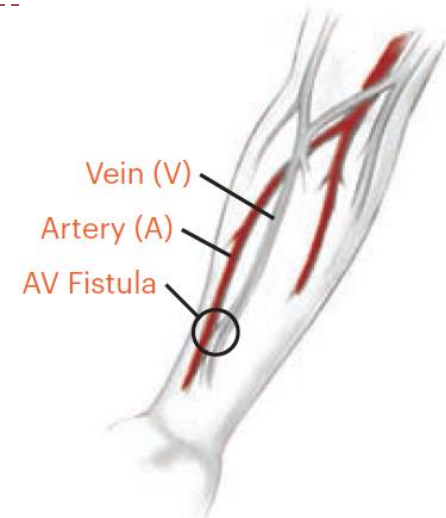
Hemodialysis Access - Catheter

- ▶ A *catheter* is most often used for a temporary access.
- ▶ ESRD - Used for a short time in people who get an AV fistula and need to start dialysis before the fistula is ready.
- ▶ Inpatients: Used for acute dialysis
- ▶ Should be used for dialysis **ONLY**
- Dialysis patients with central line access are 2–3 times more likely to be hospitalized for infection and to die of septic complications than those with AV grafts or AV fistulas.

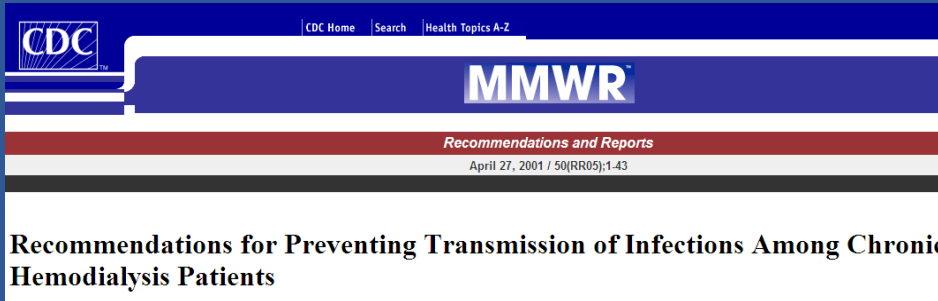


Hemodialysis Access: Fistula or Graft

- AV (artery-vein) *fistula* is the best choice for hemodialysis.
 - Preferred because it usually lasts longer and has fewer problems like clotting and infections.
-
- An AV (artery-vein) *graft* is the second choice for an access.
 - Minor surgery is done using an artificial tube between a vein and a nearby artery.



GUIDELINES, RECOMMENDATIONS & CMS



CDC Home Search Health Topics A-Z

MMWR

Recommendations and Reports

April 27, 2001 / 50(RR05):1-43

Recommendations for Preventing Transmission of Infections Among Chronic Hemodialysis Patients



CMS.gov
Centers for Medicare & Medicaid Services



ESRD Quality Incentive Program



CDC 24/7

2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings

Jane D. Siegel, MD; Emily Rhinehart, RN MPH CIC; Marguerite Jackson, PhD; Linda Chiarello, RN MS; the Healthcare Infection Control Practices Advisory Committee



HICPAC
HEALTHCARE INFECTION CONTROL PRACTICES ADVISORY COMMITTEE

NKF KDOQI GUIDELINES



National **Kidney** Foundation™

KDOQI Clinical Practice Guidelines and Clinical Practice Recommendations for Anemia in Chronic Kidney Disease (2006)



ESRD Basic
Technical Surveyor Training

Interpretive Guidance



ACIP

Advisory Committee on Immunization Practices



Dialysis Safety

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.

Hospital Rx Patients at risk

Antibiotic Prescribing in Hospitals: Proceed with Caution

1

30%

Reducing prescriptions of high-risk antibiotics by

Staff Training Video

Best Practices for Preventing Bloodstream Infections

Learn More >>



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- Clinician Education**
- Guidelines and Recommendations**
- Prevention Collaborative**

- Patient Education**
- Prevention Tools**
- Data Reports**

Following CDC Protocols

Cuts Dialysis BSIs in Half

Learn More >>

1 2 3



National Action Plan to Prevent Healthcare-Associated Infections: Roadmap to Elimination

- Injection Safety**
- Protecting Healthcare Personnel**

BLOG

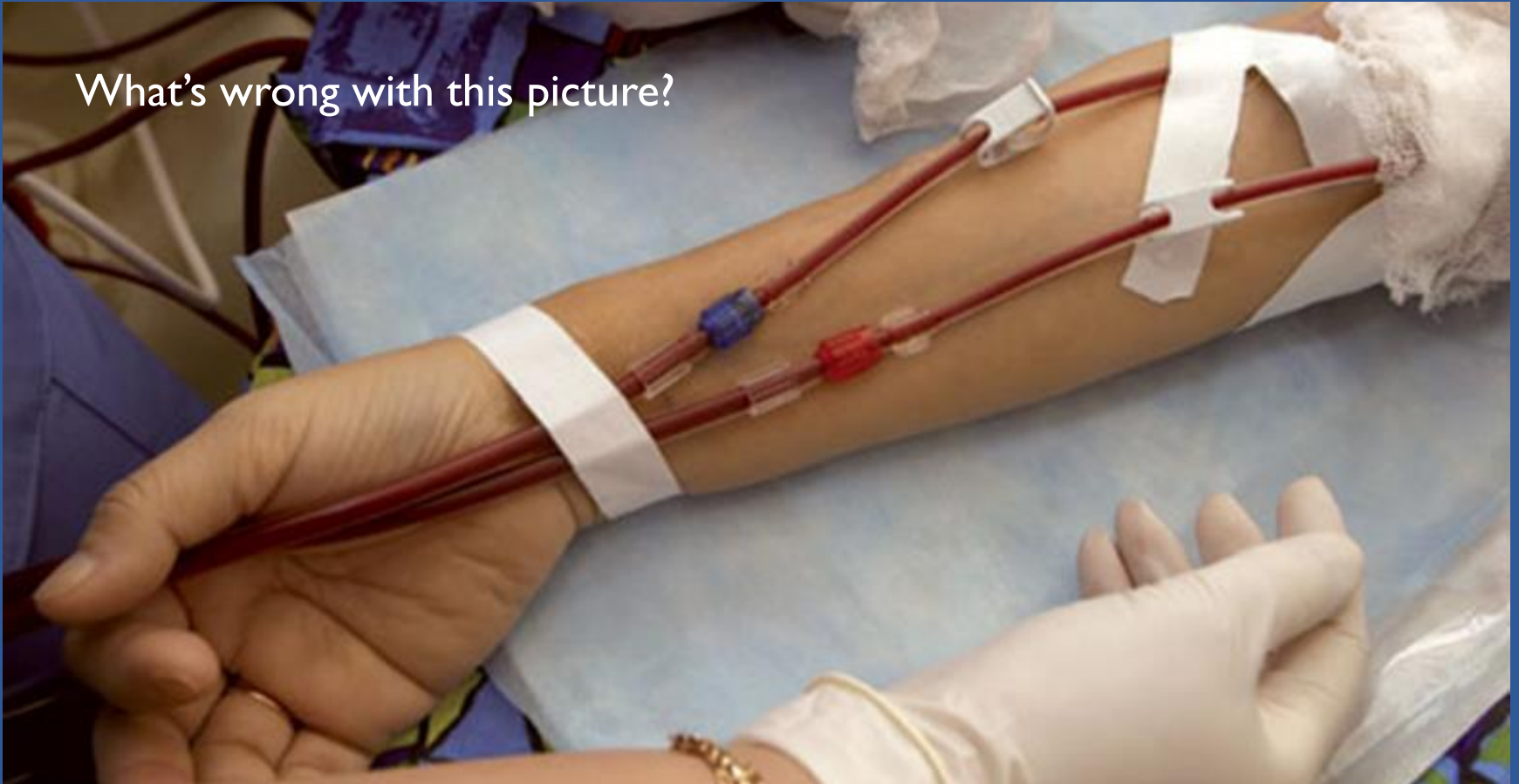
Join the conversation



NHSN
National Healthcare Safety Network
Dialysis Event

RECOMMENDED BEST PRACTICES

What's wrong with this picture?



CDC 2013 –

Approach to BSI Prevention

Set of 9
Evidence-based
Core Interventions
plus
Environmental
Surface Disinfection

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 CDC's National Healthcare Safety Network (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 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 antibiotic ointment or povidone-iodine ointment to catheter exit sites during dressing change.***

* Povidone-iodine (preferably 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#sites>). 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>



National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion



http://www.cdc.gov/dialysis/PDFs/Dialysis-Core-Interventions-5_10_13.pdf

10 Recommended Best Practices

1. Surveillance & Feedback
2. Hand hygiene & glove use observations
3. Catheter and vascular access observations
4. Patient education & engagement
5. Staff education & competency
6. Catheter reduction
7. CHG/alcohol for skin antisepsis
8. Catheter hub cleansing (aka scrub-the-hub)
9. Catheter exit site care: antimicrobial ointment or disk
10. Environmental surface disinfection



Dialysis: Infection Prevention Programs

- ▶ Creating a team
 - ▶ Leadership
 - ▶ Staff participation
 - ▶ Patient engagement
- ▶ Surveillance
 - ▶ NHSN reporting
- ▶ QAPI – make it real!
- ▶ Adherence to best practices
- ▶ Safety for all patients and healthcare providers



CDC- NHSN Surveillance

- ▶ **Outpatient Centers - CMS mandates reporting**
 - ▶ **NHSN Dialysis Module Events**
 - ▶ IV antimicrobial starts
 - ▶ Positive blood cultures
 - includes those collected within one calendar day after hospital admission
 - ▶ Pus, redness or increased swelling at the vascular access site
 - ▶ **Denominator – Patient months**
 - ▶ **Rate: Access related BSI (ARB/100 pt. months)**



NHSN Surveillance

- ▶ Hospital Inpatients
 - ▶ Included in NHSN CLABSI surveillance
 - ▶ Indicate hemodialysis catheter on NHSN Event report
- ▶ Rates – CLABSI per 1,000 line days



NHSN Inpatient CLABSI Event: *Any hemodialysis catheter present?*

Event Type*: BSI - Bloodstream Infection ▾
Post-procedure: ▾
MDRO Infection Surveillance*: ▾
Location*: ▾
Date Admitted to Facility*:

Risk Factors [HELP](#)

Central line*: ▾
Any hemodialysis catheter present: ▾

- ▶ Used to identify inpatient dialysis-associated CLABSI's.
 - ▶ Can help to assess and target CLABSI prevention efforts.
 - ▶ Preliminary CDC data:
 - ▶ Field completed 38% of the time during 2014
 - ▶ 25% occurred in patients with a dialysis catheter
-



As a hospital IP what can you do to prevent dialysis related infections?

- ▶ Build a relationship with the dialysis unit
- ▶ NHSN surveillance –
 - ▶ Use the dialysis check box for CLABSI
 - ▶ Report positive blood cultures present on admission back to the outpatient center
- ▶ Assess current practices
 - ▶ Are all recommended practices being followed?
- ▶ Support education
- ▶ Support practice monitoring



2013 CDC Recommendation:

New protocol for environmental surface disinfection.



Why is this important?

Making dialysis safer for patients

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.
- ▶ *NOTE: No Hep B dialysis associated outbreaks!*



Hepatitis C Outbreaks

Hemodialysis	YR	State	Persons Notified for Screening	Outbreak-Associated Infections	Known or suspected mode of transmission	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?



Lack of Physical Barriers or Meaningful Separation Between Stations

- ▶ Where does one station end and another begin?



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.

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!

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

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Widespread Luminescence/ Contamination Identified



High-Touch Surfaces

- ▶ No visible blood before luminal

Control panel of haemodialysis machine



Side table



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

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



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	-	+



Environmental Cleaning

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 supplies¹ 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.
- Discard tubing and dialyzers in a leak-proof container².
- Check that there is no visible soil or blood on surfaces.
- Ensure that the priming bucket has been emptied³.
- Ensure that the patient has left the dialysis station⁴.
- 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 station⁵.
- Remove gloves and perform hand hygiene.

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

- Wear clean gloves.
- Apply disinfectant⁶ to all surfaces² in the dialysis station using a wiping motion (with friction). -
- Ensure surfaces are visibly wet with disinfectant. Allow surfaces to air-dry⁸. -
- Disinfect all surfaces of the emptied priming bucket³. 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.



Cleaning the Environment: An Improvement Project Case Study



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”.**
-

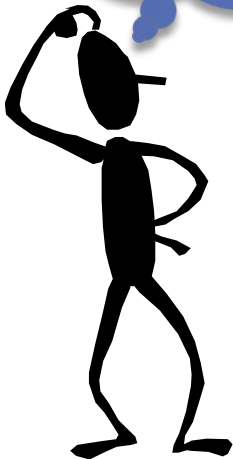


The challenge

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

*Waiting for the patient to
leave before disinfection.”*

Bet, that
won't work!



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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.....

Expect resistance

EDUCATE UP FRONT

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

BEST FOR THE PATIENT

Not a real difference in current practice

Look for the rewards

Get a champion



Something to think about

- ▶ **YOU** make the difference....
 - ▶ 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**





*Thank You from every patient:
you make a difference in their lives each and every day!*

Contact:

Sally.hess@uvmhealth.org