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
  - 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%

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

<table>
<thead>
<tr>
<th>Hemodialysis</th>
<th>YR</th>
<th>State</th>
<th>Persons Notified for Screening</th>
<th>Outbreak-Associated Infections</th>
<th>Known or suspected mode of transmission</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
<td>Outpatient dialysis center</td>
<td>2012</td>
<td>CA</td>
<td>42</td>
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<td>50</td>
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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?
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

<table>
<thead>
<tr>
<th>SITE/ SURFACE</th>
<th>% of sessions with VRE detected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dialysis treatment chair</td>
<td>58%</td>
</tr>
<tr>
<td>HCP gown</td>
<td>30%</td>
</tr>
<tr>
<td>Patient ungloved hands</td>
<td>54%</td>
</tr>
<tr>
<td>Stethoscope</td>
<td>8%</td>
</tr>
<tr>
<td>Blood pressure monitor</td>
<td>11%</td>
</tr>
<tr>
<td>Dialysis machine</td>
<td>4%</td>
</tr>
<tr>
<td>HCP gloved hands</td>
<td>8%</td>
</tr>
<tr>
<td>HCP ungloved, cleaned hands</td>
<td>8%</td>
</tr>
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**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

Widespread Luminescence/Contamination Identified

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

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

<table>
<thead>
<tr>
<th>Site</th>
<th>Visible blood stain</th>
<th>Hemoglobin test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biohazard waste bin</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Side of machine, close to BP cuff</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Dialysis Chair side of table</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Waiting area chair arm rest</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Bottom of TV in dialysis station</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
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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!!
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

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.

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
Tools & Checklists

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 available and incorporates the CDC's 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 line or cap
- Cap: refers to a device that seals the hub and prevents the insertion of needles or catheters
- Blood line: refers to the arterial and venous ends of the extracorporeal circuit that connects the patient's catheter to the dialysis machine

Catheter Connection and Disconnection Steps:

Connection Steps:
1. Perform hand hygiene and don clean gloves.
2. Close the catheter clamp before removing the cap. Make sure the hub is not plugged.
3. Disconnect the hub with caps removed using an appropriate antisepticite (see note).
   a. Optional: Prior to removing the caps, disconnect the hub to allow the blood to drain into the blood line. This prevents contamination of the blood line.
   b. Remove the caps and disconnect the hub with a sterile syringe and needle, followed by flushing the blood line with aseptically prepared normal saline solution. This step is not mandatory but recommended to prevent contamination of the arterial line.

Note: The CDC recommends using chlorhexidine gluconate or povidone-iodine for antisepticite. Other antisepticites may be used if they are approved by the FDA for use on the skin and if they have been evaluated for their effectiveness in the United States.

Disconnection Steps:
1. Perform hand hygiene and don clean gloves.
2. Clamp the catheter hub before disconnecting the blood line.
3. Disconnect the catheter using an appropriate antisepticite.

Note: The CDC recommends using chlorhexidine gluconate or povidone-iodine for antisepticite. Other antisepticites may be used if they are approved by the FDA for use on the skin and if they have been evaluated for their effectiveness in the United States.

Checklist: Dialysis Station Routine Disinfection

This list can be used if there is no visible soil or surfaces at the dialysis station. If visible soil 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 prior to Part A.

A: Before Beginning Routine Disinfection of the Dialysis Station

- Disconnect and teardown used blood tubing and dialyzer from the dialysis machine.
- Remove used blood tubing and dialyzer from the dialysis machine.
- Place the blood tubing and dialyzer in a leak-proof container.

B: Routine Disinfection of the Dialysis Station

- Use a soak solution with disinfectant and a disinfectant-impregnated cloth or brush to clean and disinfect the dialysis station.
- Use a disinfectant solution to disinfect the dialysis station.

Audit Tool: Catheter exit site care observations

Use a mark if the action performed correctly, a cross if not performed, or if not observed, leave blank.

Additional comments, if any:

- Number of procedures performed correctly:
- Total number of episodes observed:
- Total number of episodes recorded:
- Total number of episodes missed:
- Total number of episodes observed:
- Total number of episodes recorded:
- Total number of episodes missed:
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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**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 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 container.
- Check that there is no visible soil or blood on surfaces.
- Ensure that the priming bucket has been emptied.
- Ensure that the patient has left the dialysis station.
- 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.
- Remove gloves and perform hand hygiene.

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

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