

# There's More to Dialysis Than Water

Sylvia Garcia-Houchins, University of Chicago Hospitals  
A Webber Training Teleclass

There's more to dialysis than water: what you need to know about dialysis

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Hosted by Paul Webber  
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## Hemodialysis Basics

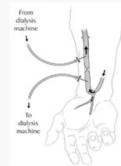
- Access - Needles or tubing carry blood to the dialyzer and then return blood
- Dialyzer – semi-permeable membrane that removes waste and extra fluid from the blood
- Dialysate – solution that passes through the membrane that pulls waste and extra fluid from the blood.
- Patients usually dialyze 3x per week for 4 – 5 hours

## Hemodialysis Basics

- Aseptic technique is essential
- **Do Not Allow** opportunities for cross contamination of bacteria or viruses
- Nothing should be done in “batch”
- Hepatitis B can live in dried blood for >7 days

## Access

- **Fistula**
  - Artery and vein surgically connected causing vein to grow larger and stronger
  - Takes 6 weeks to 4 months to mature
  - Less likely to become infected or clot
- **Graft**
  - Artificial tubing used to connect an artery and vein
  - Usually wait 3 to 6 weeks before using



## Access

- **Catheter**
  - 2006 National Kidney Foundation Kidney **Disease Outcomes Quality Initiative (NKF-DOQI)**
    - Use of 2% CHG with 70% alcohol for site care preferred
    - Disinfect catheter hubs and caps before removal with 2 swabs
    - Patient and staff wear a mask

## Hemodialysis Machine

- Single Pass
- Use blood cartridges and roller system
- Monitors conductivity of dialysate



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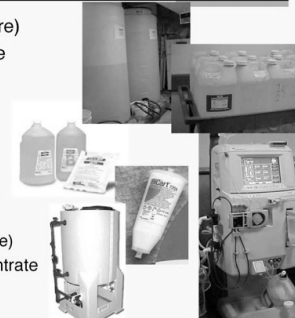
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#### Dialysate

- Acetate Dialysate (rare)
- Bicarbonate Dialysate requires mixing acid concentrate
  - NaCl
  - CaCl
  - KCl
  - MgCl
  - Acetic Acid
  - Dextrose (possible)
  - Bicarbonate Concentrate
- Processed Water



#### Dialysate

- Processed Water
  - Central system
  - Portable system
- Monitoring for
  - Chemicals
  - Bacteria
  - Endotoxin

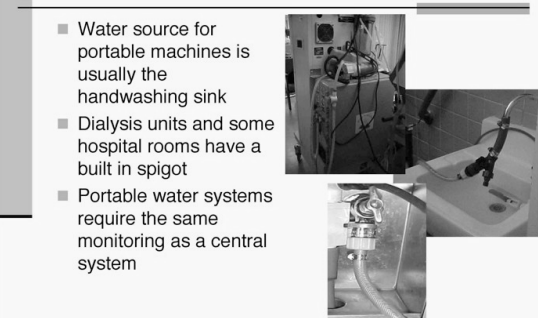


#### AAMI Water and Dialysate Standards

- Processed Water
  - Total Viable Microbial Count: <200 cfu/ml
  - Action limit: 50 cfu/ml
  - Endotoxin concentration: 1 EU/mL
- Dialysate
  - Total Viable Microbial Count: <200 cfu/ml
  - Action limit: 50 cfu/ml
  - Endotoxin concentration: 2 EU/mL
  - Action limit: 1 EU/mL

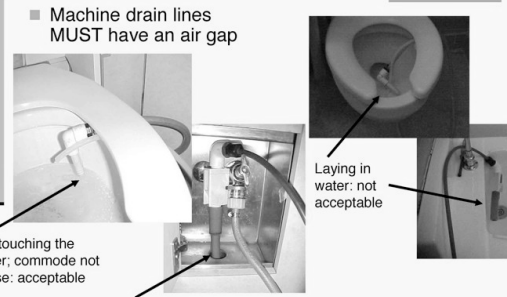
#### Portable Water Source

- Water source for portable machines is usually the handwashing sink
- Dialysis units and some hospital rooms have a built in spigot
- Portable water systems require the same monitoring as a central system



#### Hemodialysis Waste

- Machine drain lines MUST have an air gap



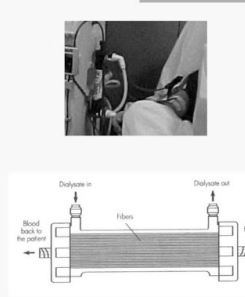
Not touching the water; commode not in use: acceptable

Laying in water: not acceptable

Questionable air gap: not acceptable

#### Dialyzer

- Majority of hemodialyzers used today are hollow-fiber, high-flux dialyzers
- Blood and dialysate compartments are separated by a potting material
- 80% of the hemodialysis units in the US reuse dialyzers more than once on the same patient



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### Why Reuse Dialyzers?

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- Reused dialyzers are safe and effective if all standards and requirements are followed
- Reduced hypersensitivity reactions
- Reduces biohazardous waste
- More economical for high flux dialyzers which are more porous and allow larger toxins to pass through

### Reuse of Dialyzers

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- Must follow the *Association for the Advancement of Medical Instrumentation (AAMI)* standards and recommended practices for reuse in order to be eligible for Medicare reimbursement
- Patient's must be informed of facilities reuse practices
- 'Complaint Investigation Record' required

### Germicides for Reuse

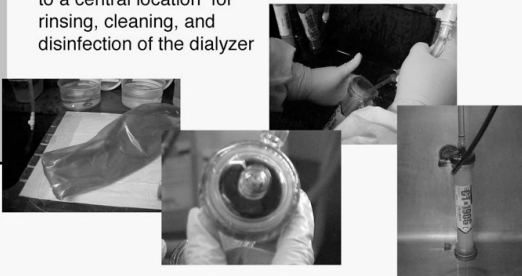
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- peracetic acid
- formaldehyde
- glutaraldehyde
- heat disinfect with citric acid

### Dialyzer Reuse Basics

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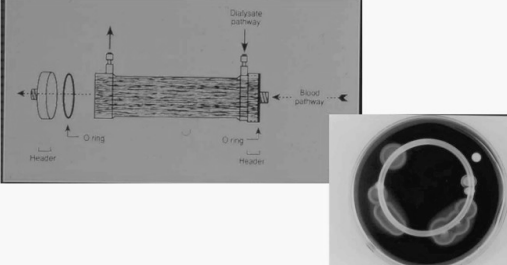
- Requires taking dialyzer to a central location for rinsing, cleaning, and disinfection of the dialyzer



### Dialyzer Reuse

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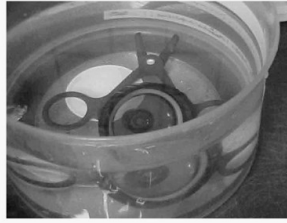
- Outbreak of gram negative bacteremia linked to contamination of o-rings



### Dialyzer Reuse

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- Removable caps must be exposed to disinfectant before being reassembled
- All dialyzer end caps contain o-rings
- Some dialyzers have removable end caps




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### Dialyzer Reuse

- Leak Test
- Total Cell (fiber bundle) Volume should be over 80%
- Fill with germicide
- Disinfect outside of dialyzer
- Blood and dialysis compartment caps disinfected before attachment
- Automated system is better




### Dialyzer Reuse

- Confirm presence of germicide
- Allow adequate dwell time



### Dialyzer Reuse

- What should you see?
  - Dialyzer should look clean
  - No more than a few clotted fiber bundles
  - Clean tops and bottoms
  - Caps on all openings; no leaking
  - Clearly labeled with patient's name, number of previous uses, date of the last reprocessing




### Dialyzer Reuse

- What should you ask for?
  - Track Urea Reduction Value and Kt/V,
  - Fiber bundle and germicide fill should be readily available
  - Average reuses by week or month should be tracked: decreased number of uses could signal reprocessing issues


### Dialyzer Reuse

- Rinse immediately prior to reuse
- Must recirculate to prevent rebound
- Check for residual germicide immediately prior to initiation of dialysis



### Problems related to priming/rinsing

- 1988-1990: Dialysis blood tubing was contaminated with ultrafiltrate waste during dialyzer setup.
- Bacteremias were controlled by halting the practice of attaching the venous tubing directly to a waste container while priming the membrane, by emphasizing glove changes and handwashing after contact with ultrafiltrate waste and by daily decontamination of ultrafiltrate waste container.



Longfield, RN et al: Clustered bacteremias in a hemodialysis unit: cross-contamination of blood tubing from ultrafiltrate waste. Infect Control Hosp Epidemiol. 1992 Mar;13(3):190-4.



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### Problems related to priming/rinsing

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- Hemodialysis machine manufacturers responded by developing a Waste Handling Option (WHO) for "Safe and effective disposal of prime fluid, eliminating the cost for waste containers, while reducing staff exposure to potentially infectious and chemical waste" ([www.usa-gambro.com](http://www.usa-gambro.com))

Cobe Centrysystem 3
Phoenix® Dialysis System


### Problems related to priming/rinsing

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- CDC. **Outbreaks of gram-negative bacterial bloodstream infections traced to probable contamination of hemodialysis machines--Canada, 1995; United States, 1997; and Israel, 1997.** MMWR Morb Mortal Wkly Rep. 1998 Jan 30;47(3):55-9.

Arnow PM, Garcia-Houchins S, et al. **An outbreak of bloodstream infections arising from hemodialysis equipment** J Infect Dis. 1998 Sep;178(3):783-91.



Olver WJ, et al. **Two cases of Enterococcus faecalis bacteremia associated with a hemodialysis machine.** J Infect Dis. 1999 May;179(5):1312.




### Problems related to priming/rinsing

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- Why is the WHO a problem?







### Problems related to priming/rinsing

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- What is the solution?
  - Disposable waste container that is discarded after each prime/rinse
  - Reusable waste container that is disinfected between uses
  - Impeccable Aseptic Technique
  - Disinfect hub before each connection step



### Hepatitis



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- Outbreaks linked to...
- Failure to identify and isolate HBV infected individuals during dialysis
  - If status unknown treat as positive
    - Cohort machine
    - Private treatment
- Sharing of staff
- Sharing of supplies and equipment
- Failure to vaccinate susceptible patients
- Inadequate Disinfection

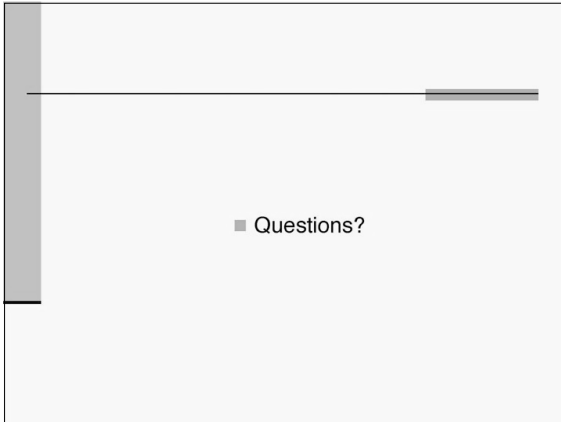
### Hepatitis

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- Prevention includes...
- If hepatitis B status unknown treat as positive
  - Cohort machine
  - Separate from others
  - Do not reprocess dialyzers
- Do not share or batch supplies and equipment
- Vaccinate susceptible patients and monitor response
- Disinfect with bleach solution

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THE NEXT FEW TELECLASSES	
12 Feb. 09	<i>Listeria, Clostridium difficile, MRSA – The Foodborne Link</i> Speaker: Prof. Keith Warriner, University of Guelph
19 Feb. 09	<i>The "Save Lives: Clean Your Hands" Initiative</i> Speaker: Dr. Didier Pittet & Dr. Cyrus Engineer, World Health Organisation <i>(South Pacific Teleclass) Friday the 13th – An Outbreak of Invasive Group A</i>
25 Feb. 09	<i>Serratia marcescens</i> Speaker: Julianne Toop, Princess Margaret Hospital, Christchurch
05 Mar. 09	<i>Novice – Basics of Steam Sterilization</i> Speaker: Dr. Lynne Schulster, CDC
10 Mar. 09	<i>(British Teleclass) Gleaning Gold from Surveillance Data</i> Speaker: Andrew Pearson, Health Protection Agency
12 Mar. 09	<i>Novice – Fundamentals of HAI Definitions</i> Speaker: Robert Garcia, Brookdale University, New York
19 Mar. 09	<i>Novice – Basics of Controlling Device-Related Infections</i> Speaker: Loretta Litz Fauerbach, Shands Hospital, University of Florida
24 Mar. 09	<i>(Free Teleclass) Voices of CHICA – Part 1</i> Speaker: CHICA-Canada Board Members & Guests

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