# Healthcare Drains & HAIs: Challenges and Solutions

Karoline Sperling, MPH, MLS, CIC, FAPIC

Clinical Services Manager

April 2024

# Disclosures

Karoline Sperling is the clinical services manager at Ecolab.

This presentation is for educational purposes only.

The views and opinions expressed are those of the presenter and do not necessarily reflect the official policy or position of any agency, organization, employer or company.

# Objectives

- Discuss how healthcare drains can be a reservoir for healthcare-associated infections (HAIs)
- Describe outbreaks associated with healthcare drains
- Review current guidance on preventing drain-associated infections

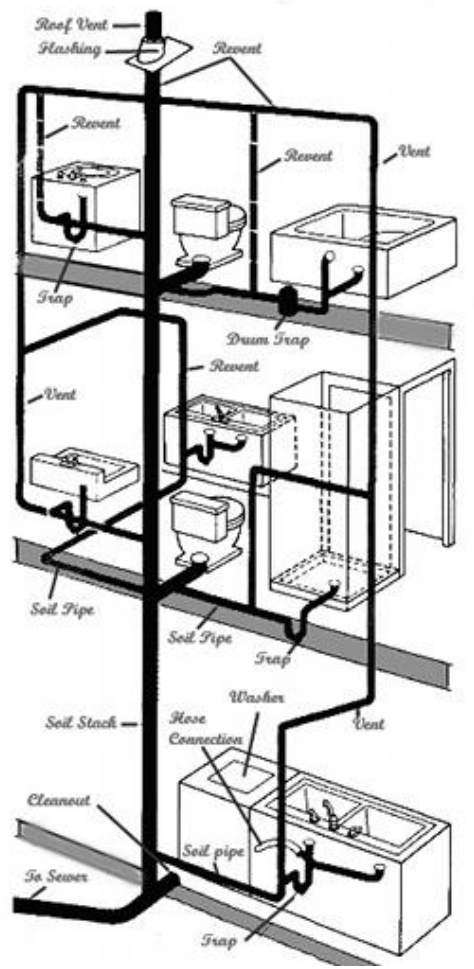
# Water & Healthcare

**Water**

- Foundation of life
- Wet environments can pose a risk for infection
- Tap water is not sterile

**Water in healthcare**

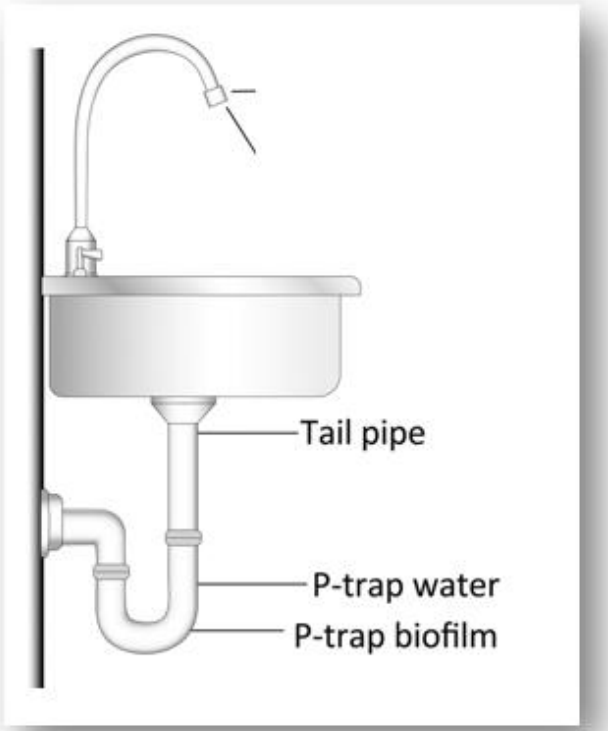
- Various ways water can be used
- Vulnerable patient populations
- Large, complex and often old plumbing systems




Dickey. *APIC Text*, 2014

# Types of Wastewater Drains

- Sinks
- Showers
- Whirlpools
- Toilets
- Hoppers




**Challenges**

- Reservoirs for bacteria to grow, survive and form biofilm
- P traps - needed to prevent escape of sewer gas

Franco, et al. *Sci Rep,* 2020.
https://doi.org/10.1038/s41598-020-65052-7

# Sinks in Hospitals

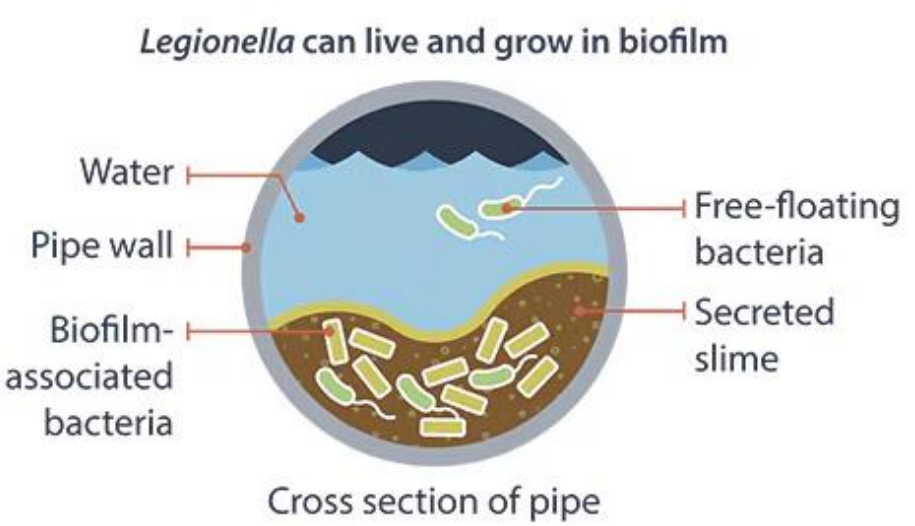
- Handwashing
- Waste disposal: body fluids, unused medications or tube feeds
- Patient care: bathing, perineal care
- Reprocessing: cleaning and soaking of instruments

**Challenges**

- Clean vs. dirty – designated sinks for certain tasks
- Location, location, location!!!

# Water-associated Pathogens

- Bacteria and fungal contamination risks
- Common microorganisms:
  - Pseudomonas aeruginosa
  - Serratia
  - Legionella
  - Mycobacteria (non-tuberculosis)




CDC, 2018
Legionella Healthcare Facilities | CDC

**Challenges**

- Biofilm formation
- Antibiotic resistance – carbapenem-resistant organisms (CROs)
  - Resistant traits shared directly via mobile genetic elements

# How Antibiotic Resistance Moves Directly Germ to Germ

Any antibiotic use can lead to antibiotic resistance. Antibiotics kill germs like bacteria and fungi, but the resistant survivors remain.

Resistance traits can be inherited generation to generation. They can also pass directly from germ to germ by way of **mobile genetic elements**.

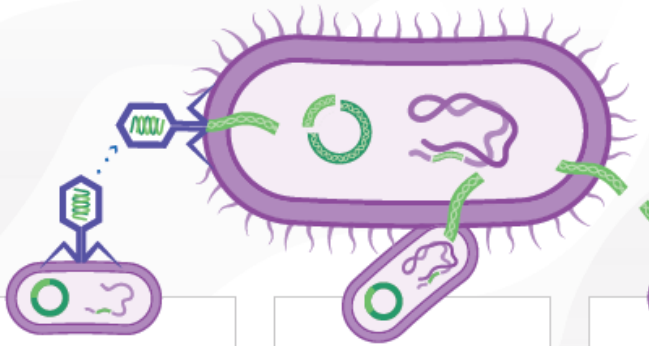
## Mobile Genetic Elements

**Plasmids**
Circles of DNA that can move between cells.

**Transposons**
Small pieces of DNA that can go into and change the overall DNA of a cell. These can move from chromosomes (which carry all the genes essential for germ survival) to plasmids and back.

**Phages**
Viruses that attack germs and can carry DNA from germ to germ.

## How Mobile Genetic Elements Work



**Transduction**
Resistance genes can be transferred from one germ to another via phages.

**Conjugation**
Resistance genes can be transferred between germs when they connect.

**Transformation**
Resistance genes released from nearby live or dead germs can be picked up directly by another germ.

https://www.cdc.gov/drugresistance/about/how-resistance-happens.html

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RESEARCH ARTICLE

# Genomic Analysis of Hospital Plumbing Reveals Diverse Reservoir of Bacterial Plasmids Conferring Carbapenem Resistance

Rebecca A. Weingarten,[a] Ryan C. Johnson,[b] Sean Conlan,[b] Amanda M. Ramsburg,[a] John P. Dekker,[a] Anna F. Lau,[a] Pavel Khil,[a] Robin T. Odom,[a] Clay Deming,[b] Morgan Park,[c] Pamela J. Thomas,[c] NISC Comparative Sequencing Program,[c] David K. Henderson,[a] Tara N. Palmore,[a] Julia A. Segre,[b] Karen M. Frank[a]

[a]National Institutes of Health Clinical Center, Bethesda, Maryland, USA
[b]National Human Genome Research Institute, Bethesda, Maryland, USA
[c]NIH Intramural Sequencing Center, Rockville, Maryland, USA

**Found common plasmid backbones in patient and environmental CPOs**

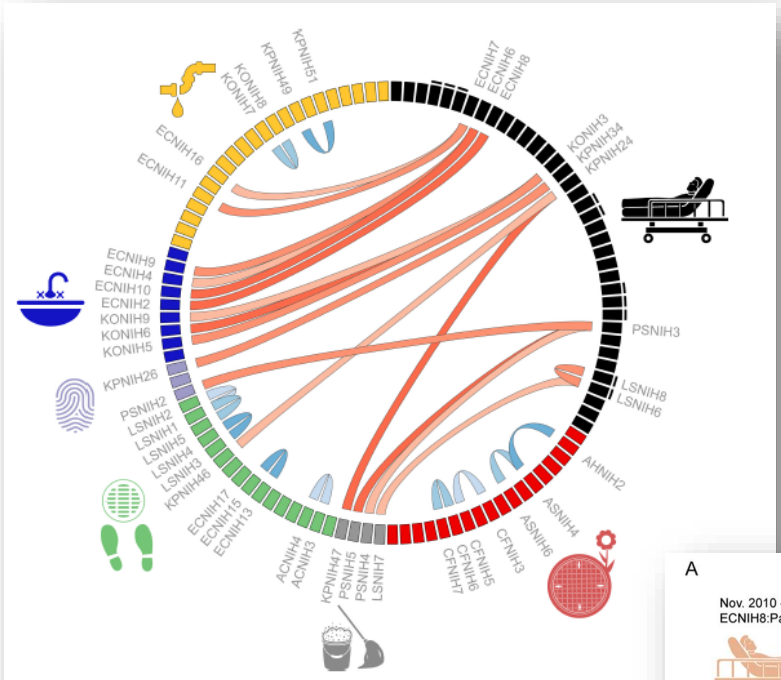
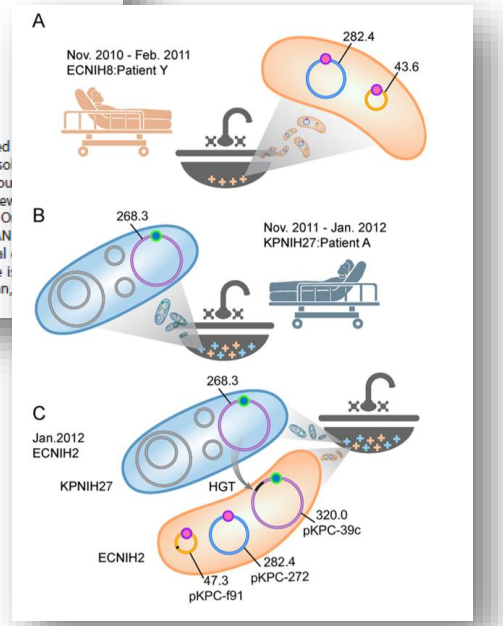
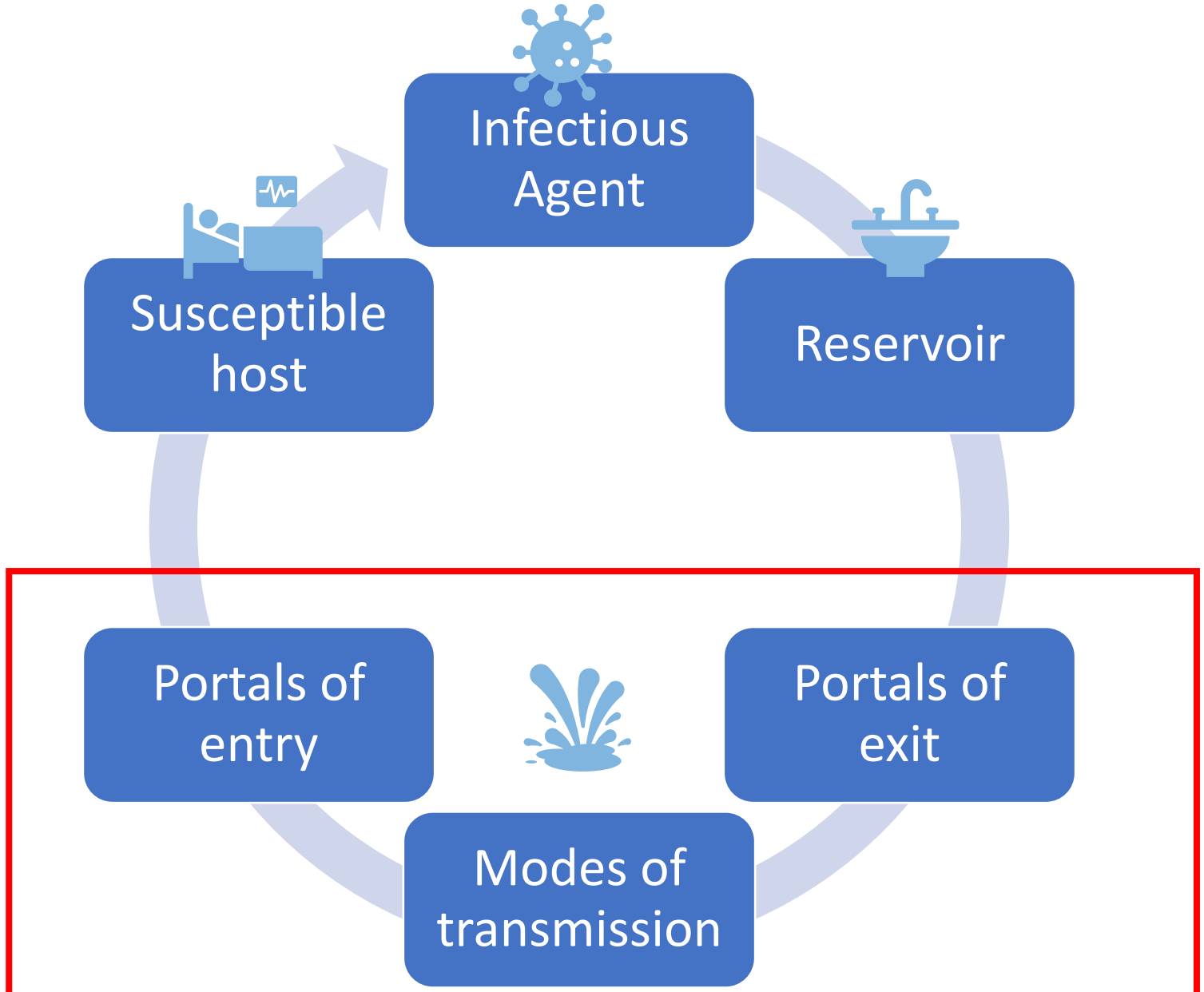



**FIG 1** Connections identified on the basis of the genome sequence similarity of CPOs isolated environment and patients. Each rectangle in the outer ring represents a sequenced $bla_{KPC}$-positive iso color coded on the basis of the source. Black, patient; red, wastewater manhole; light gray, hou equipment; green, housekeeping closet drain; purple, high-touch surface; dark blue, sink; yellow, wastew Four patients have multiple isolates, and these are clustered and denoted by additional black bars. O indicate >99.90% ANI between patient and environmental isolates. Blue arcs indicate >99.90% AN environmental isolates. Arc color saturation does not have meaning and is used solely to aid the visual of links. Redundant arcs between environmental isolates are excluded for simplicity. The isolate name i only if an environmental connection was found. Icon credits: Alonzo Design, Kathy Konkle, cihanterlan, Panpty, istrejman/Getty Images under license.




Weingarten et al. *mBio*. 2018;9(1):e02011-17.
doi:10.1128/mBio.02011-17


Infectious Agent
Reservoir
Portals of exit
Modes of transmission
Portals of entry
Susceptible host

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# Spread from the Sink to the Patient: *In Situ* Study Using Green Fluorescent Protein (GFP)-Expressing *Escherichia coli* To Model Bacterial Dispersion from Hand-Washing Sink-Trap Reservoirs

**Shireen Kotay,[a] Weidong Chai,[a] William Guilford,[b] Katie Barry,[a] Amy J. Mathers[a,c]**

Division of Infectious Diseases and International Health, Department of Medicine, University of Virginia Health System, Charlottesville, Virginia, USA[a]; Department of Biomedical Engineering, University of Virginia, Charlottesville, Virginia, USA[b]; Clinical Microbiology, Department of Pathology, University of Virginia Health System, Charlottesville, Virginia, USA[c]

**Biofilm growth = 1 inch per day**

Kotay, et. al. *Appl Environ Microbiol.* 2017;83:e03327-16.
doi:10.1128/AEM.03327-16

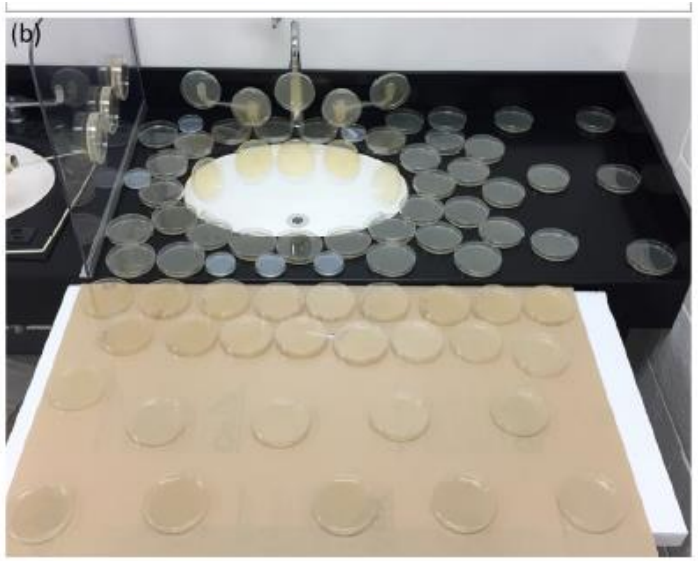


**FIG 6** (a) Layout of the zones of the sink counter, bowl, and extension surface designated to monitor droplet dispersion and (b) layout of the TSA plates used for GFP-expressing *E. coli* droplet dispersion on the surfaces surrounding the sink.

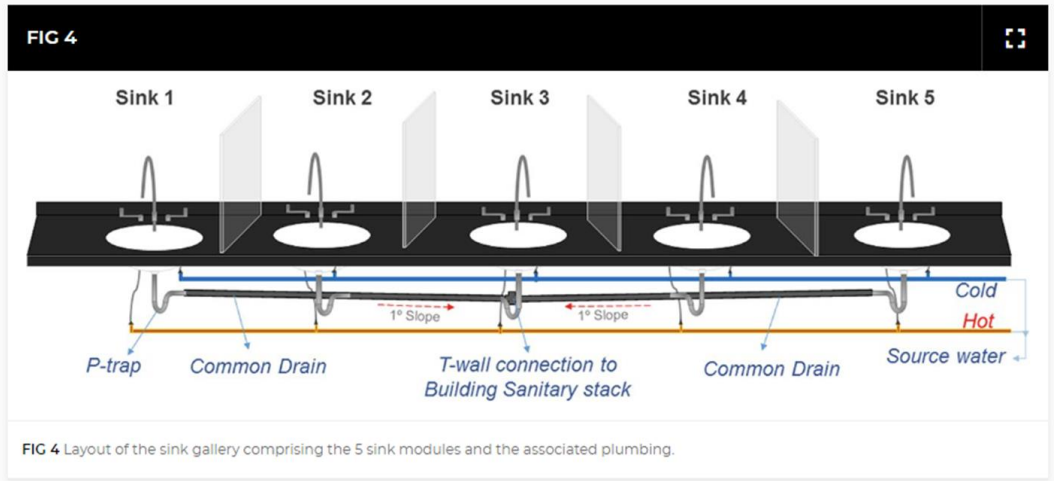


FIG 4 Layout of the sink gallery comprising the 5 sink modules and the associated plumbing.

Current Opinion in
Infectious Diseases

Articles & Issues For Authors Journal Info

Cite

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NOSOCOMIAL AND HEALTHCARE RELATED INFECTIONS: EDITED BY TRISH M. PERL

# Hospital water as the source of healthcare-associated infection and antimicrobial-resistant organisms

Hayward, Claire[a]; Brown, Melissa H.[b]; Whiley, Harriet[a]

Author Information

*Current Opinion in Infectious Diseases* 35(4):p 339-345, August 2022. | **DOI:** 10.1097/QCO.0000000000000842

**Basin splashing**
**Direct or indirect contact**

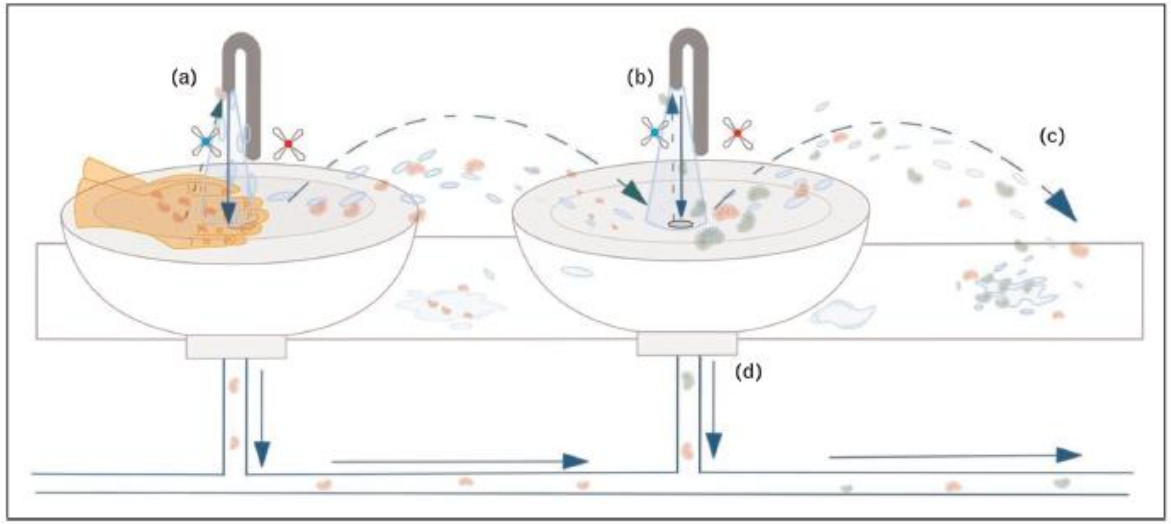



**FIGURE 1.** Proposed mechanisms for outlet contamination. Solid arrows indicate intended direction of water flow. Dashed arrows indicate subsequent splashing of potentially contaminated water. (a) Washing of soiled hands resulting in splashing to the surrounding environment and neighbouring basins, and causing retrograde contamination of the tap faucet with human microflora (shown in light grey), indicated by dashed grey arrows. (b) Water flow hitting the contaminated drain located directly below the faucet, causing retrograde contamination of the tap faucet with opportunistic premise plumbing pathogens (shown in grey), indicated by the dashed dark grey arrow. (c) Splashing from handwash basin contaminating the surrounding environment with both human flora (shown in light grey) and opportunistic premise plumbing pathogens (shown in grey). (d) Colonization of the deeper premise plumbing infrastructure with both human flora (shown in light grey) and opportunistic premise plumbing pathogens (shown in grey).

Hayward et. al. *Curr Opin Infect Dis.* 2022, 35:339-345.
doi:10.1097/QCO.0000000000000842

# Sink-related Outbreaks

and more….

*Clinical Infectious Diseases*

INVITED ARTICLE

HEALTHCARE EPIDEMIOLOGY: Robert A. Weinstein, Section Editor

# Healthcare Outbreaks Associated With a Water Reservoir and Infection Prevention Strategies

**Hajime Kanamori,[1,2] David J. Weber,[1,2] and William A. Rutala[1,2]**

[1]Division of Infectious Diseases, Univers

*Clinical Infectious Diseases*

REVIEW ARTICLE

# The Hospital Water Environment as a Reservoir for Carbapenem-Resistant Organisms Causing Hospital-Acquired Infections—A Systematic Review of the Literature

**Alice E. Kizny Gordon,[1] Amy J. Mathers,[3] Elaine Y. L. Cheong,[4,5] Thomas G
Derrick W. Crook[1,2] and Nicole Stoesser[1]**

[1]Modernising Medical Microbiology Consortium, Nuffield Department of Medicine, John Rad
[3]Division of Infectious Diseases and International Health, Department of Medicine, University
Concord Repatriation Hospital, Sydney, and [5]University of Sydney, Australia

*Table 1 continued.*

| lation | Type of Infection | Molecular Typing | Study Type | First Author, Year |
|---|---|---|---|---|
| tological | Nosocomial infection and febrile neutropenia | RAPD, PFGE | Outbreak – strong causation | Wong, 2011 [38] |
| | Pneumonia | PFGE | Outbreak – strong causation | Guyot, 2013 [39] |
| nnaires' | Healthcare-associated Legionnaires' disease | Sequencing | Outbreak – strong causation | Demirjian, 2015 [40] |
| nt with | Disseminated infection | AP-PCR typing | Case report (single) – strong causation | Kauppinen, 1999 [41] |
| ward | Bacteremia | PFGE | Outbreak – strong causation | Lyytikainen, 2001 [42] |
| ts | Aspergillosis | RAPD | Case report (single) – strong causation | Anaissie, 2002 [43] |
| sing homes | Pontiac fever | NA | Case series (multiple) | Bauer, 2008 [44] |
| | Catheter-associated BSI | Repetitive element PCR, RAPD, PFGE | Outbreak – strong causation | Cooksey, 2008 [45] |
| | Bloodstream infection | PFGE (unrelated) | Case series | Horii, 2011 [46] |

*Infection Control & Hospital Epidemiology* (2018), **39**, 1463–1466
doi:10.1017/ice.2018.273

**Commentary**

# Water as a source for colonization and infection with multidrug-resistant pathogens: Focus on sinks

Sarah S. Lewis MD, MPH[1,2], Becky A. Smith[1,2], Emily E. Sickbert-Bennett[3,4] and David J. Weber[3,4]

[1]Infection Prevention and Hospital Epidemiology, Duke University Hospital, Durham, North Carolina, [2]Division of Infectious Diseases, Duke University School of Medicine, Durham, North Carolina, [3]Department of Hospital Epidemiology, University of North Carolina Hospitals, Chapel Hill, North Carolina and [4]Division of Infectious Diseases, University of North Carolina School of Medicine, Chapel Hill, North Carolina

*Infection Control & Hospital Epidemiology* (2018), **39**, 972–979
doi:10.1017/ice.2018.138

**Review**

# Wastewater drains: epidemiology and interventions in 23 carbapenem-resistant organism outbreaks

Philip C. Carling MD, FSHEA[1,2]
[1]Infectious Diseases Section, Steward Carney Hospital, Boston, Massachusetts and [2]Boston University School of Medicine, Boston, Massachusetts

## Summary of WWD CRO outbreak characteristics ➔

- Extended waste water drains (WWD) associated carbapenem resistant organisms (CRO) outbreaks have been increasingly recognized during the past 10 years in 12 countries on 4 continents.
- Almost all outbreaks occurred in intensive care and hematology/oncology special treatment units.
- Low incidence density of clinical cases and the frequently long intervals between cases adversely impacted outbreak recognition as well as evaluation of mitigation interventions.
- In these outbreak settings most WWDs were colonized with outbreak strain organisms.
- Drain disinfection treatment protocols had limited, if any, lasting impact on CRO drain system colonization.
- Sink drain system replacement alone would appear to have a limited, if any, lasting impact on CRO colonization as a result of biofilm re-colonization from more distal components o f the drain system.
- Sink drain biofilm colonizing gram-negative bacteria are readily capable of both intra-species as well as inter-species transfer of many forms of gene mediated antibiotic resistance.

Carling, P. *ICHE.* 2018, 39(8):972-979.
doi:10.1017/ice.2018.138

*Infection Control & Hospital Epidemiology* (2024), **45**, 284–291
doi:10.1017/ice.2023.270

**Original Article**

## Sink-traps are a major source for carbapenemase-producing *Enterobacteriaceae* transmission

Gili Regev-Yochay MD, MPH[1,2], Ili Margalit MD, MPH[1,2], Gillian Smollan MD[3], Rotem Rapaport BSc[1,2], Ilana Tal MA[1], William P. Hanage PhD[4], Nani Pinas
Galia Rahav MD[2,5], Eyal Zimlichman
[1]Infection Prevention & Control Unit, Sheba Medic
Sheba Medical Center, Ramat-Gan, Israel, [4]Center
Massachusetts, [5]Infectious Disease Unit, Sheba Me
Ari'el, Samaria

*Infection Control & Hospital Epidemiology* (2024), **45**, 292–301
doi:10.1017/ice.2023.231

**Original Article**

## Concurrent transmission of multiple carbapenemases in a long-term acute-care hospital

Danielle A. Rankin PhD[1,2,3,a], Maroya Spalding Walters PhD[3,a], Luz Caicedo MPH[1], Paige Gable MPH[3],
Heather A. Moulton-Meissner PhD[3], Allison Chan MPH
Gillian McAllister MPH[3], Alyssa Kent PhD[3], Alison Lau
Linda Thomas MPH[4], Nychie Q. Dotson PhD[2,5] and Alvin
[1]Florida Department of Health in Orange County, Orlando, Florida, [2]Bureau
Healthcare Quality Promotion, Centers for Disease Control and Prevention,
Nashville, Tennessee and [5]HCA Healthcare, Nashville, Tennessee

*Infection Control & Hospital Epidemiology* (2024), **45**, 302–309
doi:10.1017/ice.2023.289

**Original Article**

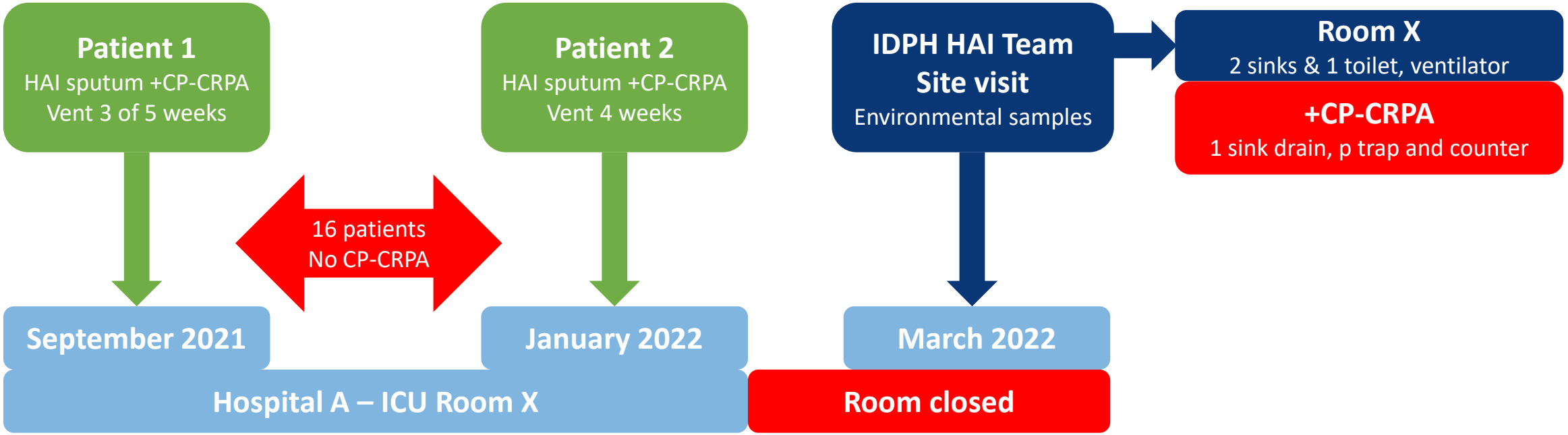
## Identification of carbapenem-resistant organism (CRO) contamination of in-room sinks in intensive care units in a new hospital bed tower

Bobby G. Warren MPS[1,2,3,a], Becky A. Smith MD[1,2,3,a], Aaron Barrett BS[1,2,3], Amanda M. Graves MPH[1,2,3],
Alicia Nelson MPH[1,2,3], Erin Gettler MD[1,2,3], Sarah S. Lewis MPH MD[1,2,3] and Deverick J. Anderson MD, MPH[1,2,3]
[1]Division of Infectious Diseases, Duke Center for Antimicrobial Stewardship and Infection Prevention, Durham, North Carolina, [2]Disinfection, Resistance and Transmission Epidemiology (DiRTE) Lab, Duke University School of Medicine, Durham, North Carolina and [3]Division of Infectious Diseases, Duke University School of Medicine, Durham, North Carolina


40 min PLAY

**March 2024 - Episode 47**
The role of sink and drain contamination in pathogen transmission

# MMWR August 2023: Cluster of Carbapenemase-Producing Carbapenem-Resistant *Pseudomonas aeruginosa* in an Adult ICU

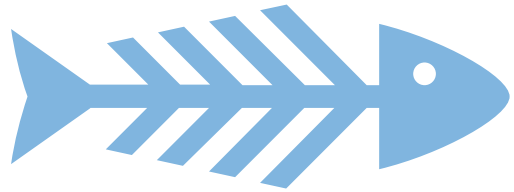


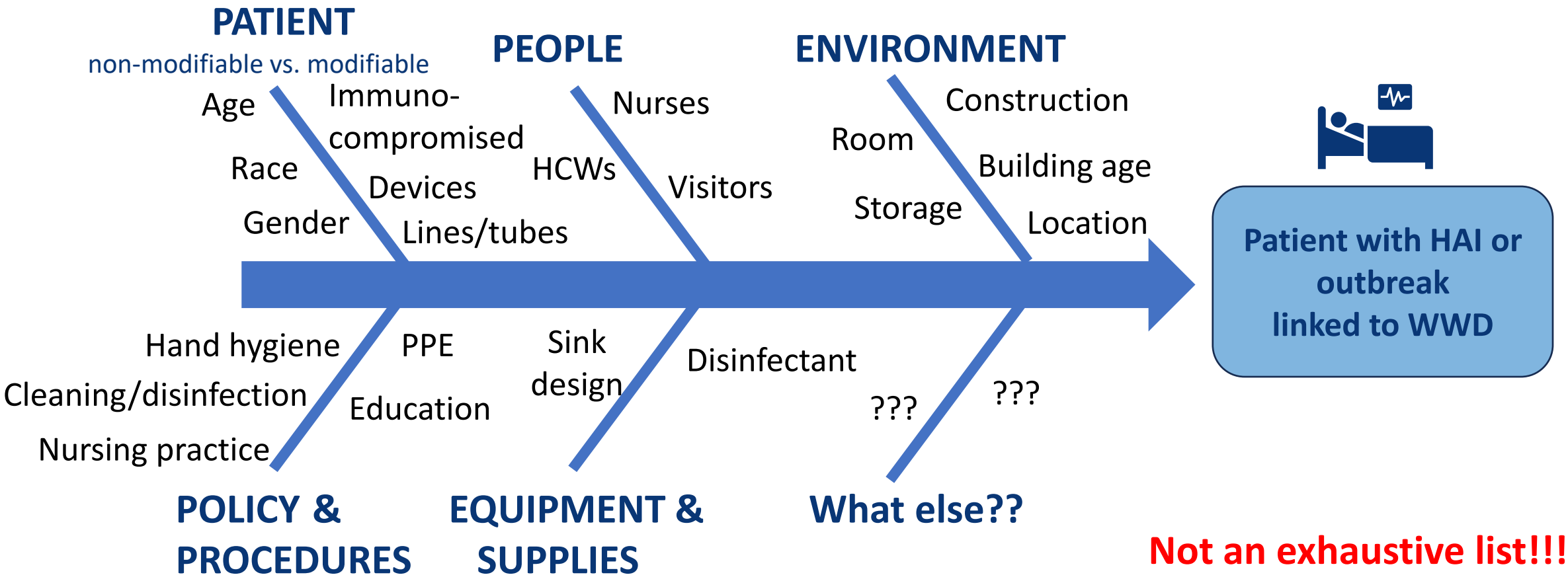

Cahill ME, et al. MMWR. 2023(72):844-846
doi:10.15585/mmwr.mm7231a2

# Solutions

and unanswered questions….

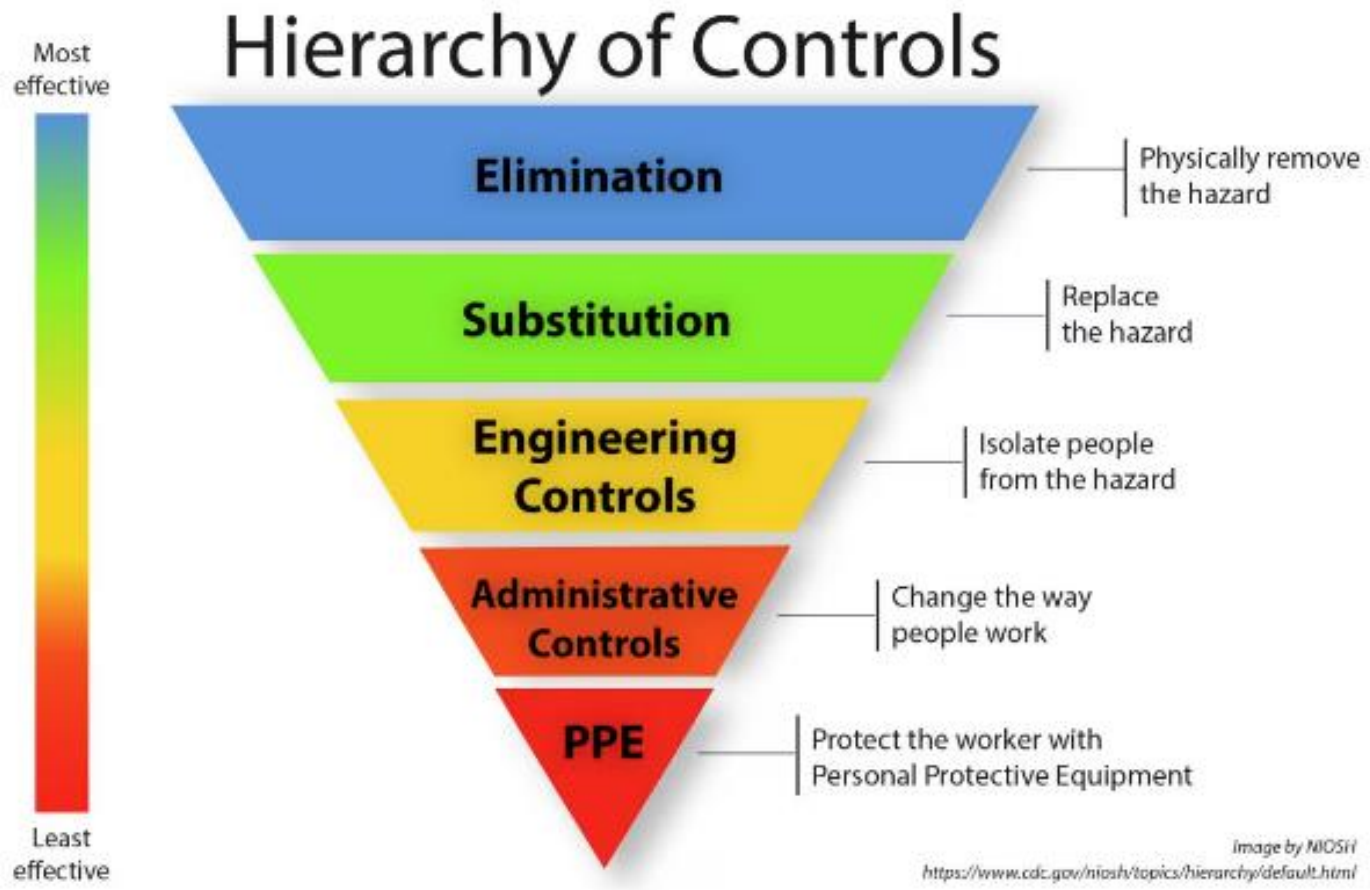
# Wastewater Drain HAI Fishbone






**Not an exhaustive list!!!**

# CDC: Hierarchy of Controls



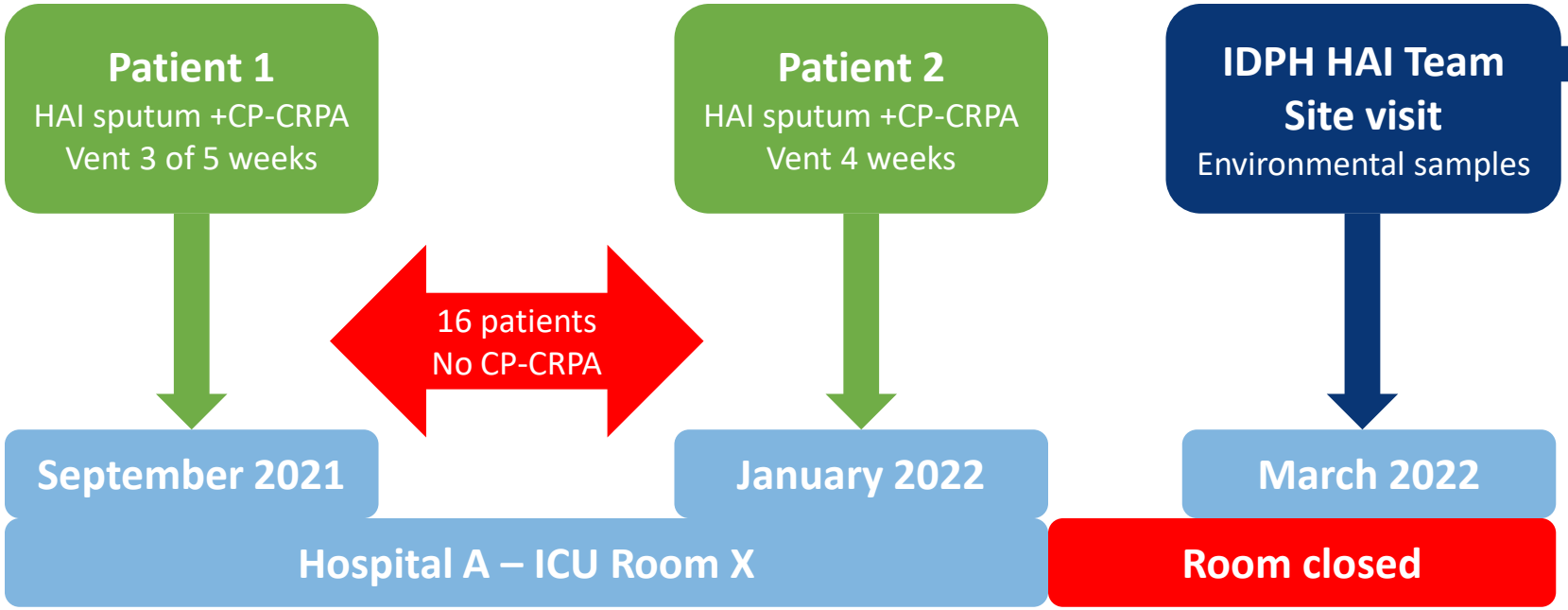
# SHEA/IDSA/APIC Hand Hygiene: 2022 Update

## **Reduce environmental contamination associated with sinks and sink drains** *(Quality of Evidence: HIGH)*

- Sinks constructed according to code and handwashing sinks part of i**nfection control risk assessments**
- **Dedicate** sinks to handwashing, if possible
- Education on **proper disposal** of substances that promote growth of biofilm in handwashing sinks (e.g., IV solutions, meds, food, human waste)
- Use EPA-registered healthcare disinfectant to **clean sink bowls and faucets daily**
- **Do not keep** medications or patient care supplies on counters or mobile surfaces within 1 meter (3 feet) of sink
- Consult with state or local public health when investigating confirmed or suspected water-associated HAI outbreaks

Glowicz, J. *ICHE*. 2023, 44(3):355-376
doi:10.1017/ice.2022.304

# MMWR August 2023: Cluster of Carbapenemase-Producing Carbapenem-Resistant *Pseudomonas aeruginosa* in an Adult ICU




**Interventions**

- Close Room x pending sink drain disinfection with hydrogen peroxide-based foam
- Sink splash guards
- Weekly disinfection for all ICU room drains (daily for 3 days, then every 3-5 days)
- Sink hygiene practices
- Colonization screening

Cahill ME, et al. MMWR. 2023(72):844-846
doi:10.15585/mmwr.mm7231a2

# Antimicrobial-resistant bacteria* detected in two patients was linked to a contaminated sink in an intensive care unit

Multidrug-resistant *Pseudomonas aeruginosa*, a serious threat in the U.S., can persist in the health care environment, particularly in wastewater plumbing

## A hospital stopped an outbreak of resistant *Pseudomonas aeruginosa*


* Carbapenemase-producing carbapenem-resistant *Pseudomonas aeruginosa*


bit.ly/mm7231a2

AUGUST 4, 2023

MMWR


https://twitter.com/CDCMMWR/status/1687541447967309824

# Solutions: Sinks

- Design - depth of bowl, size, material
- Faucet
  - Spout relative to strainer (directly over vs. offset, pressure)
  - Automatic vs. manual (flushing)
- Splash guards
- Drain covers

Livingston et. al. *ICHE*, 2018.

**Challenges**

- Cost benefit
- Doesn’t address bioburden in drain

# Solutions: Other approaches

- Flushing with ozonated water
- Heater-vibrator device for trap disinfection
- Replace or remove sinks
- Replace p-traps

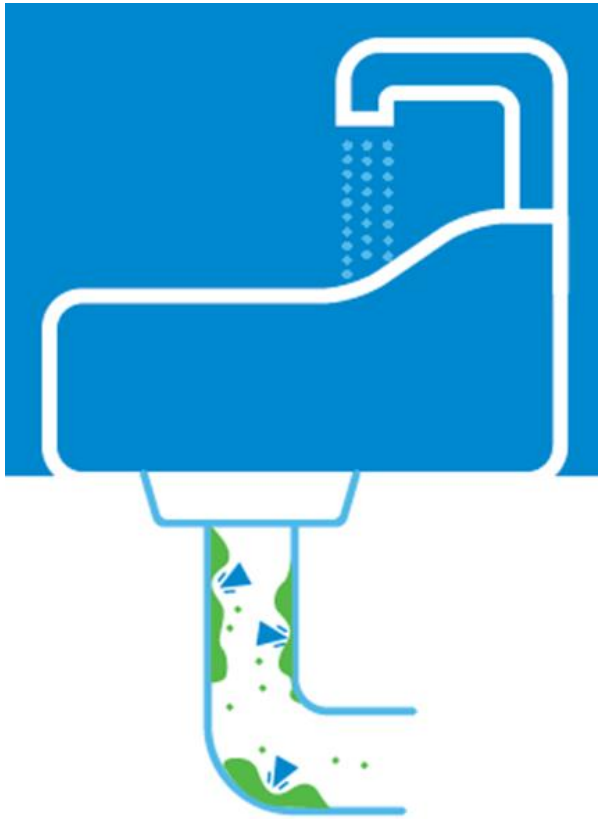
**Challenge:**

- Cost
- Labor intensive
- Temporary fix


Mathers et. al. *CID,* 2018.

# Solutions: Disinfectants

- Bleach, acetic acid, hydrogen peroxide, etc.
- Pouring chemical disinfectants down drains
  - Rapid flow prevents adequate contact time and poor penetration
  - Solutions: stop valve, inflated urinary catheter balloon or foam pump
- EPA-registered foam disinfectant against biofilm in drains *(hydrogen peroxide 3.13%, peracetic acid 0.05%, octanoic acid 0.099%)*



**Challenge**

- Frequency
- Labor

*Infection Control & Hospital Epidemiology* (2020), **41**, 280–285
doi:10.1017/ice.2019.325

**Original Article**

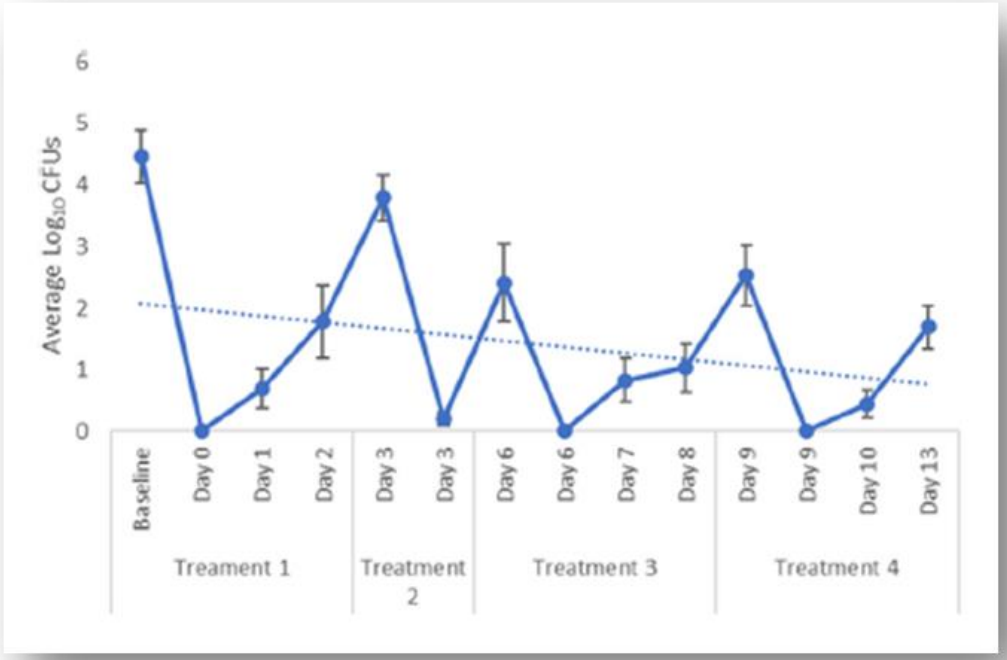
# Effectiveness of foam disinfectants in reducing sink-drain gram-negative bacterial colonization

Lucas D. Jones BS[1,2,a], Thriveen S.C. Mana MNO[2,3,a], Jennifer L. Cadnum BS[2], Annette L. Jencson BS, CIC[2], Sandra Y. Silva MD[4], Brigid M. Wilson PhD[5] and Curtis J. Donskey MD[5,6]

[1]Department of Molecular Biology and Microbiology, Case Western Reserve University School of Medicine, Cleveland Ohio, [2]Research Service, Louis Stokes Cleveland Veterans' Affairs Medical Center, Cleveland Ohio, [3]Division of Infectious Diseases and HIV Medicine, Case Western Reserve University School of Medicine, Cleveland Ohio, [4]Clinical Translational Science Program, Case Western Reserve University School of Medicine, Cleveland, Ohio, [5]Geriatric Research, Education, and Clinical Center, Louis Stokes Cleveland VA Medical Center, Cleveland, Ohio and [6]Department of Medicine, Case Western Reserve University School of Medicine, Cleveland, Ohio

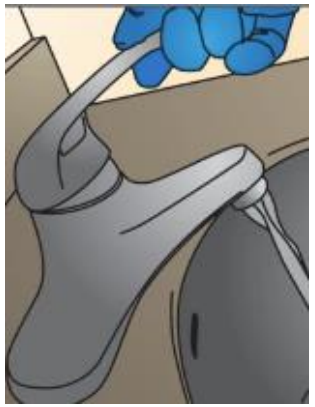
**Hydrogen peroxide 3.13%, peracetic acid 0.05%, octanoic acid 0.099% disinfectant reduced bioburden Day 0,3,6 and 9**

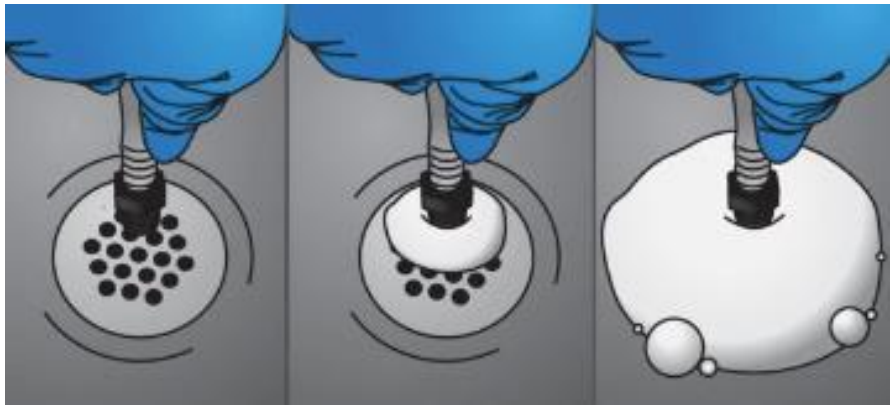
**Intermittent use = simple, practical approach**

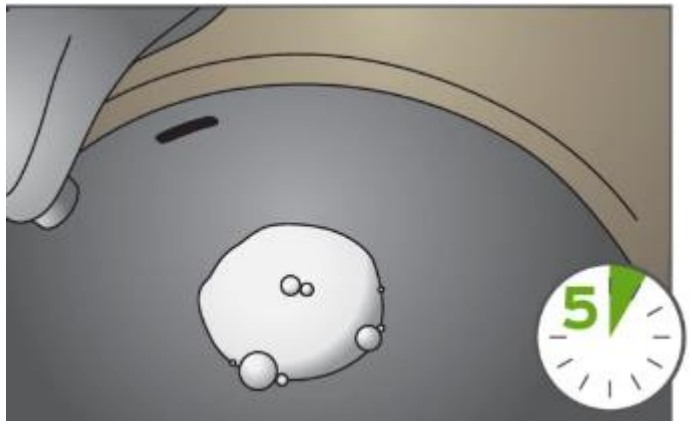


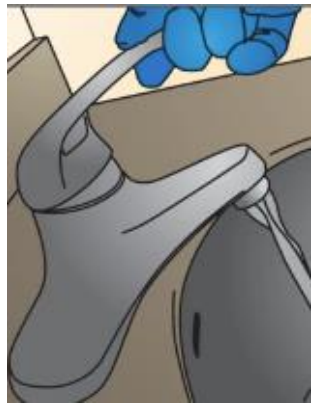

Jones, LD, et al. *ICHE.* 2020, 41:280-285.
doi: 10.1017/ice.2019.325

# Example: How to apply foam disinfectant







1. Fill foam pump with disinfectant and pressurize
2. Flush drain with water to make sure not blocked
3. Apply foam until excess pools at drain screen
4. Allow appropriate contact time
5. Drain may be rinsed

*Infection Control & Hospital Epidemiology* (2020), **41**, 358–360
doi:10.1017/ice.2019.316

**Concise Communication**

# How frequently should sink drains be disinfected?

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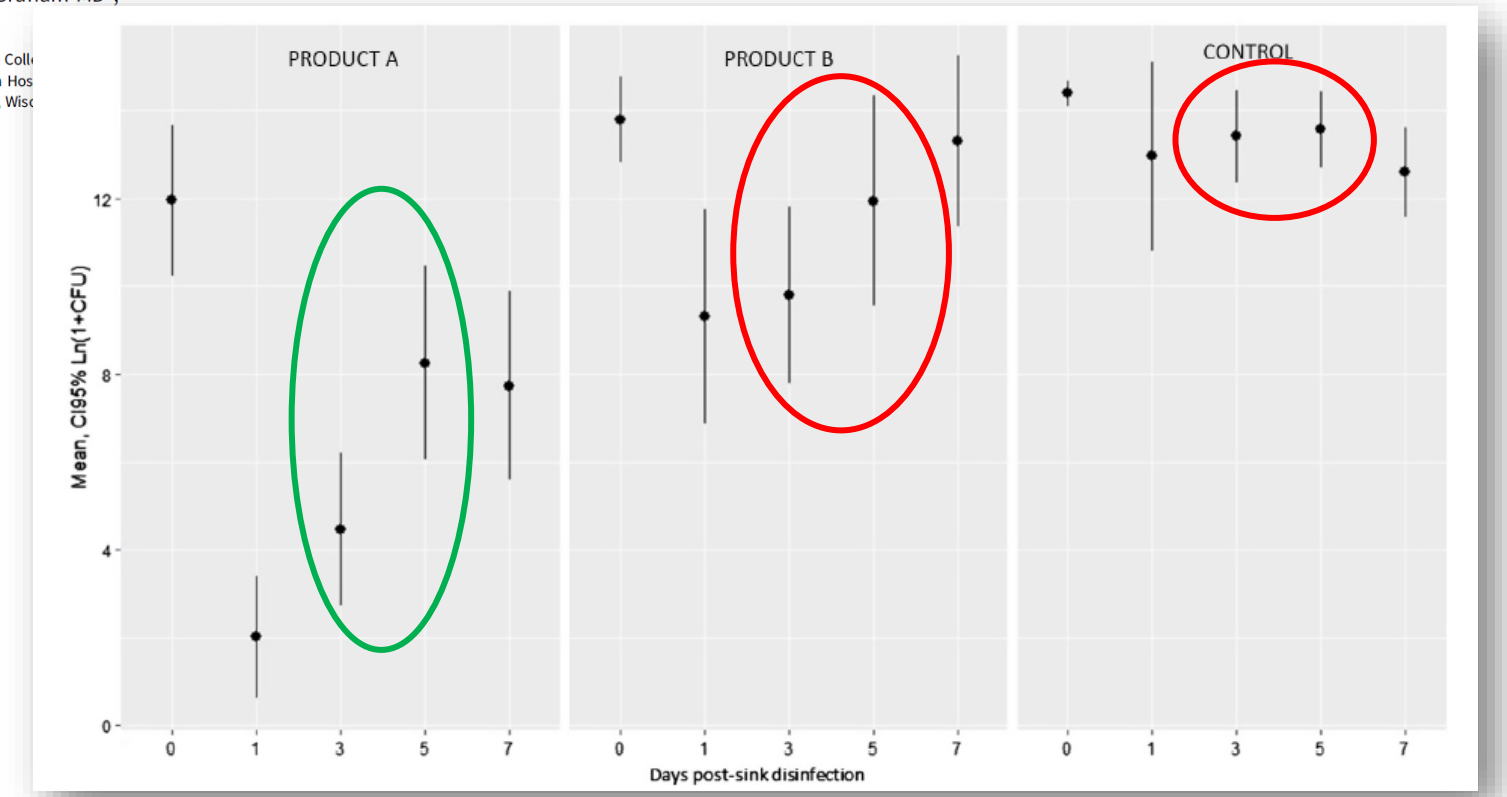
**Every 3-5 days based on results, cost, and ease of use**

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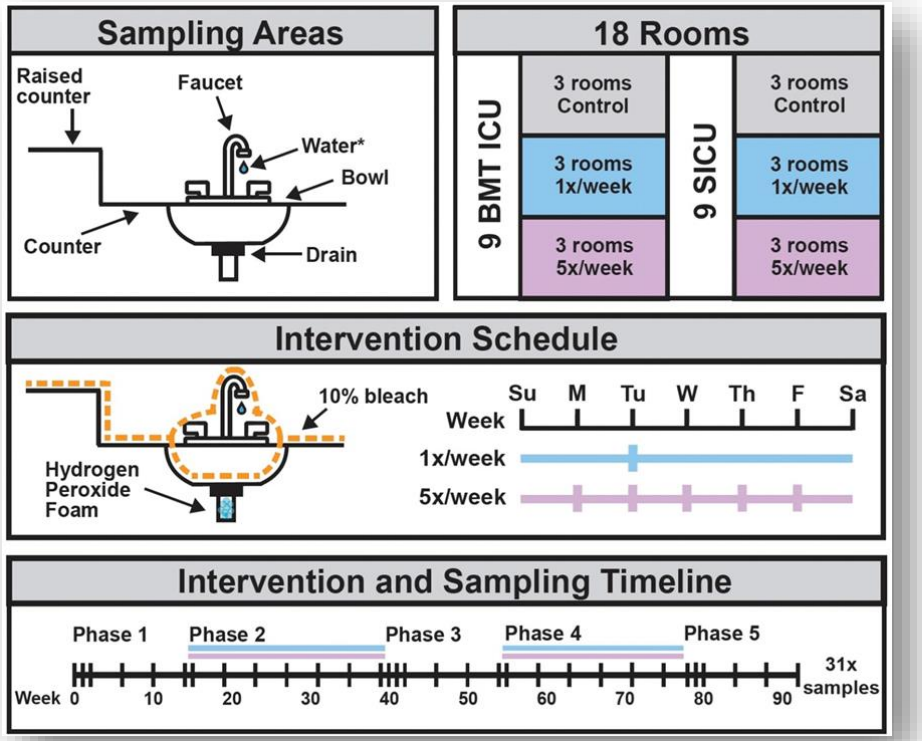
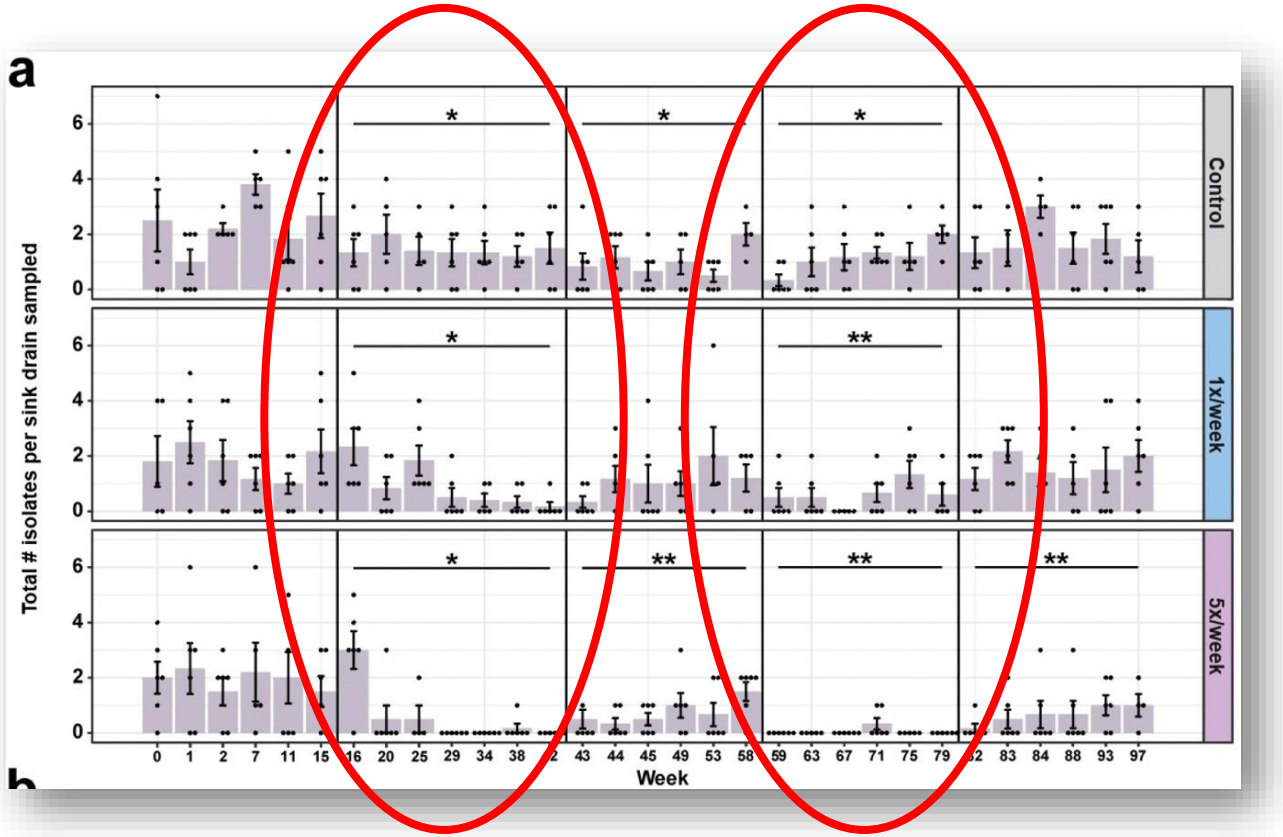
JOURNAL ARTICLE

# 981. Sink drain environmental hygiene intervention successfully reduces burden of AROs

Erin Newcomer, BS, Carrie O'Neal, MA, MPH, Lucy Vogt, MPH, David Macdonald, BA,

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doi:10.1093/ofid/ofad500.036

# Infection Prevention for Sinks

## Sink hygiene

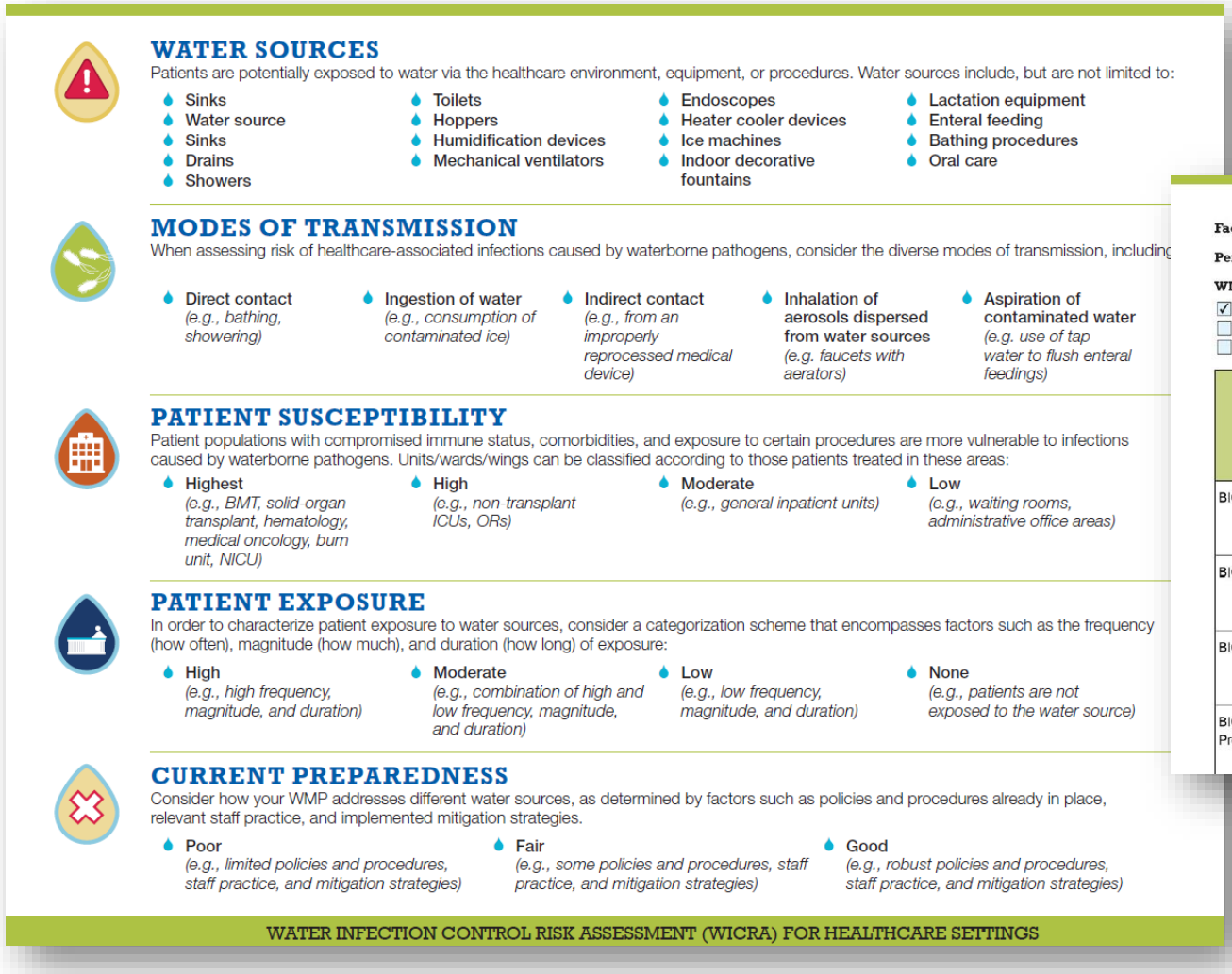
- Only soap and water down drain
- Splash guards
- No storage near ‘splash zone’ (3 feet)

## Sinks included in water management plan/risk assessment

## When considering sink disinfection

- MDRO risk – admission/colonization screening, local epi
- High-risk areas - ICU, BMT, transplant
- Frequency and labor

# Resources



## WATER SOURCES

Patients are potentially exposed to water via the healthcare environment, equipment, or procedures. Water sources include, but are not limited to:

- Sinks
- Water source
- Sinks
- Drains
- Showers
- Toilets
- Hoppers
- Humidification devices
- Mechanical ventilators
- Endoscopes
- Heater cooler devices
- Ice machines
- Indoor decorative fountains
- Lactation equipment
- Enteral feeding
- Bathing procedures
- Oral care

## MODES OF TRANSMISSION

When assessing risk of healthcare-associated infections caused by waterborne pathogens, consider the diverse modes of transmission, including

- **Direct contact** *(e.g., bathing, showering)*
- **Ingestion of water** *(e.g., consumption of contaminated ice)*
- **Indirect contact** *(e.g., from an improperly reprocessed medical device)*
- **Inhalation of aerosols dispersed from water sources** *(e.g. faucets with aerators)*
- **Aspiration of contaminated water** *(e.g. use of tap water to flush enteral feedings)*

## PATIENT SUSCEPTIBILITY

Patient populations with compromised immune status, comorbidities, and exposure to certain procedures are more vulnerable to infections caused by waterborne pathogens. Units/wards/wings can be classified according to those patients treated in these areas:

- **Highest** *(e.g., BMT, solid-organ transplant, hematology, medical oncology, burn unit, NICU)*
- **High** *(e.g., non-transplant ICUs, ORs)*
- **Moderate** *(e.g., general inpatient units)*
- **Low** *(e.g., waiting rooms, administrative office areas)*

## PATIENT EXPOSURE

In order to characterize patient exposure to water sources, consider a categorization scheme that encompasses factors such as the frequency (how often), magnitude (how much), and duration (how long) of exposure:

- **High** *(e.g., high frequency, magnitude, and duration)*
- **Moderate** *(e.g., combination of high and low frequency, magnitude, and duration)*
- **Low** *(e.g., low frequency, magnitude, and duration)*
- **None** *(e.g., patients are not exposed to the water source)*

## CURRENT PREPAREDNESS

Consider how your WMP addresses different water sources, as determined by factors such as policies and procedures already in place, relevant staff practice, and implemented mitigation strategies.

- **Poor** *(e.g., limited policies and procedures, staff practice, and mitigation strategies)*
- **Fair** *(e.g., some policies and procedures, staff practice, and mitigation strategies)*
- **Good** *(e.g., robust policies and procedures, staff practice, and mitigation strategies)*

WATER INFECTION CONTROL RISK ASSESSMENT (WICRA) FOR HEALTHCARE SETTINGS

## Water Infection Control Risk Assessment (WICRA) for Healthcare Settings

**Facility Name:** Hospital A **Assessment Location:** Burn ICU

**Performed By (names):** Jane Smith and John Doe **Assessment Date:** 10/01/2020

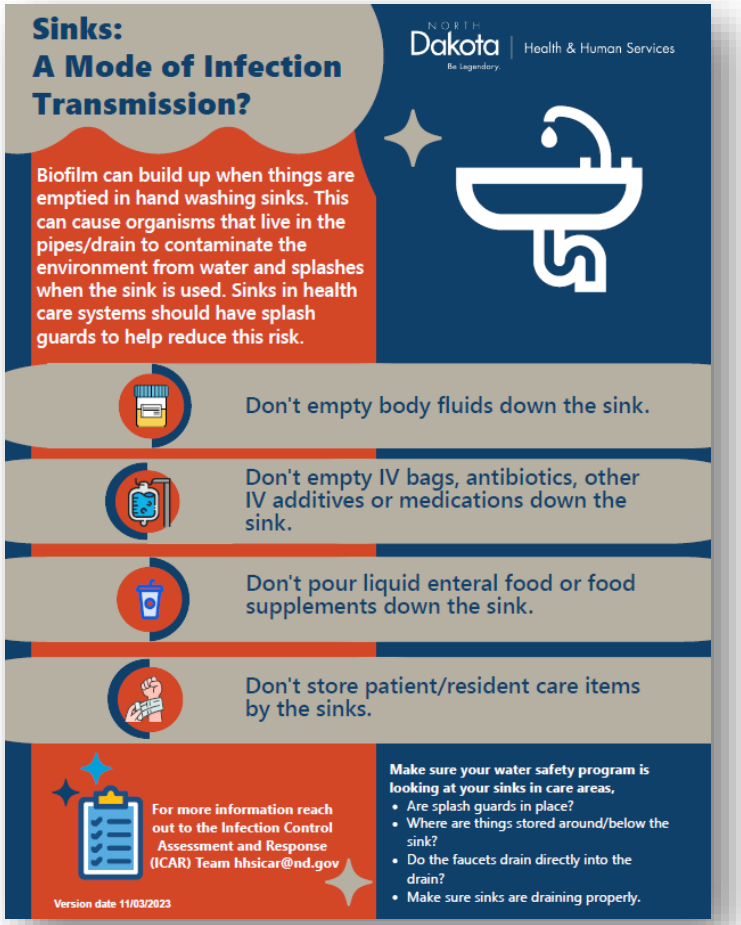
**WMP Team Role(s)** *(check all that apply):*

- ☑ Hospital Epidemiologist/Infection Preventionist
- ☑ Facilities Manager/Engineer
- ☐ Environmental Services
- ☐ Compliance/Safety Officer
- ☐ Risk/Quality Management Staff
- ☐ Infectious Disease Clinician
- ☐ Consultant
- ☐ Equipment/Chemical Acquisition/Supplier
- ☐ Other *(please specify)*:

| Location | Water Source | Modes of Transmission | Patient Susceptibility<br>Highest = 4<br>High = 3<br>Moderate = 2<br>Low = 1 | Patient Exposure<br>High = 3<br>Moderate = 2<br>Low = 1<br>None = 0 | Current Preparedness<br>Poor = 3<br>Fair = 2<br>Good = 1 | Total Risk Score<br>= Patient Susceptability x Patient Exposure x Preparedness | Comments |
|---|---|---|---|---|---|---|---|
| BICU Inpatient Rooms | Sink counter storage of patient care supplies | Indirect contact; splashing onto supplies | 4 | 3 | 3 | 36 | Install splash guards; QI for sink hygiene; and flushing |
| BICU Inpatient Rooms | Toilets without lid | Direct contact | 4 | 3 | 2 | 24 | Place lid on toilet if in patient room |
| BICU Soiled Utility | Hopper, no lid, behind closed door | Indirect contact | 4 | 2 | 1 | 8 | Automatic door closure; appropriate soiled equipment storage |
| BICU Medication Preparation Room | Sink with aerator, no splash guard | Aerosolization, and potential for splashing | 4 | 2 | 3 | 24 | Install splash guards; evaluate removing aerator |

https://www.cdc.gov/hai/prevent/environment/water.html

# Resources





https://www.hhs.nd.gov/sites/www/files/documents/.../HAI/Sinks_IPC.pdf

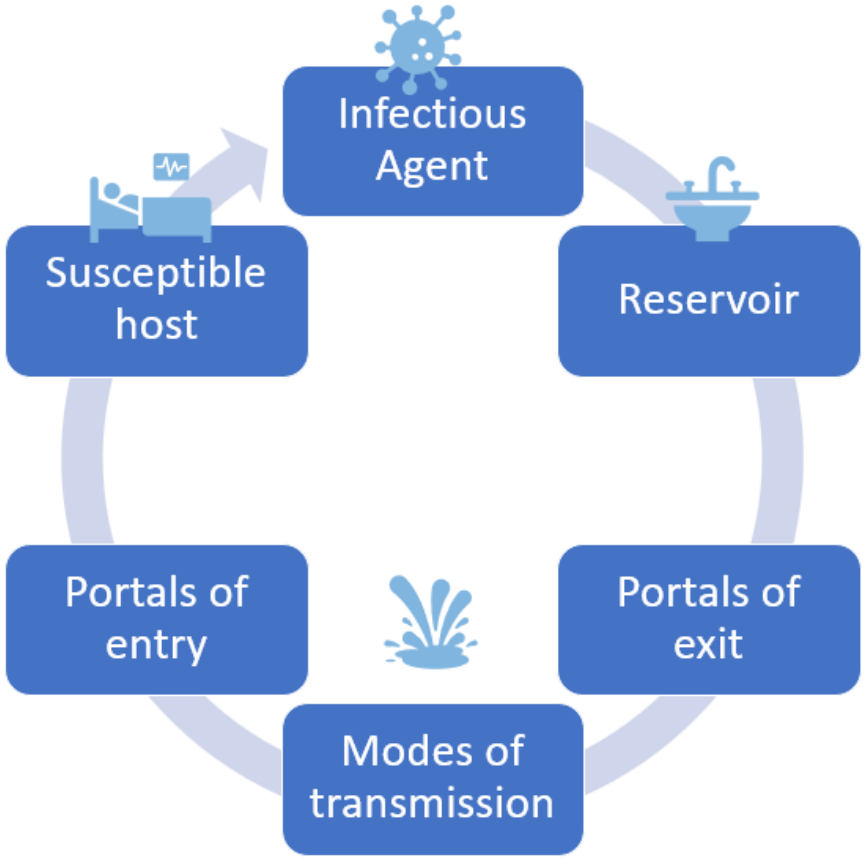
https://www.cdc.gov/infectioncontrol/projectfirstline/healthcare/germs-environment.html

# Summary

Sinks and other wastewater drains are reservoirs for pathogens, especially MDROs

Sinks have been linked to numerous outbreaks

A multi-modal, proactive approach is key to breaking the chain



# Thank you!

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Image: J. Stout, Special Pathogens Laboratory

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