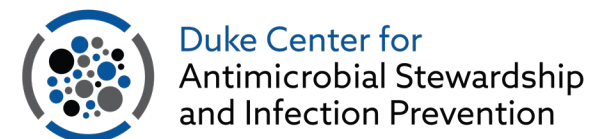


Efficacy of a Foamed Disinfectant in Reducing Pathogen Contamination in Renovated Inpatient In-Room Sinks: A Randomized Controlled Trial

Bobby G. Warren, Amanda M. Graves, Guerbine Fils-Aime, Aaron Barrett, Isadora Mamikunian, Becky A. Smith, Deverick J. Anderson

Friday, May 16, 2025



No Disclosures



Background

- 700,000 HAIs annually in the US
- Traditional transmission = healthcare providers' hands
 - Healthcare environment has emerged as a key contributor
- Outbreaks related to hospital wastewater are increasingly recognized
 - Sinks in patient rooms are of particular concern

Unpublished Outbreaks

Observational Study > Infect Control Hosp Epidemiol. 2019 Jun;40(6):621-626.

doi: 10.1017/ice.2019.60. Epub 2019 Apr 3.

Investigation of healthcare infection risks from water-related organisms: Summary of CDC consultations, 2014–2017

Kiran M Perkins ¹, Sujan C Reddy ¹, Ryan Fagan ¹, Matthew J Arduino ¹, Joseph F Perz ¹

Affiliations + expand

PMID: 30942147 PMCID: PMC7883772 DOI: 10.1017/ice.2019.60

[Free PMC article](#)

- 620 consultations analyzed
 - 134 (21.6%) water-related
 - 10.3 mean patients involved per investigation (range: 0-163)
 - >20 organisms as pathogen of concern
 - NTM (30%), *Pseudomonas spp.* (19%), *Enterobacterales* (10%)
 - 8% involved >1 pathogen
 - 34% involved MDROs



In-room Sinks

> *J Hosp Infect.* 2023 Sep;139:99-105. doi: 10.1016/j.jhin.2023.05.018. Epub 2023 Jun 10.

Sinks in patient rooms in ICUs are associated with higher rates of hospital-acquired infection: a retrospective analysis of 552 ICUs

G-B Fucini ¹, C Geffers ², F Schwab ², M Behnke ², W Sunder ³, J Moellmann ³, P Gastmeier ²

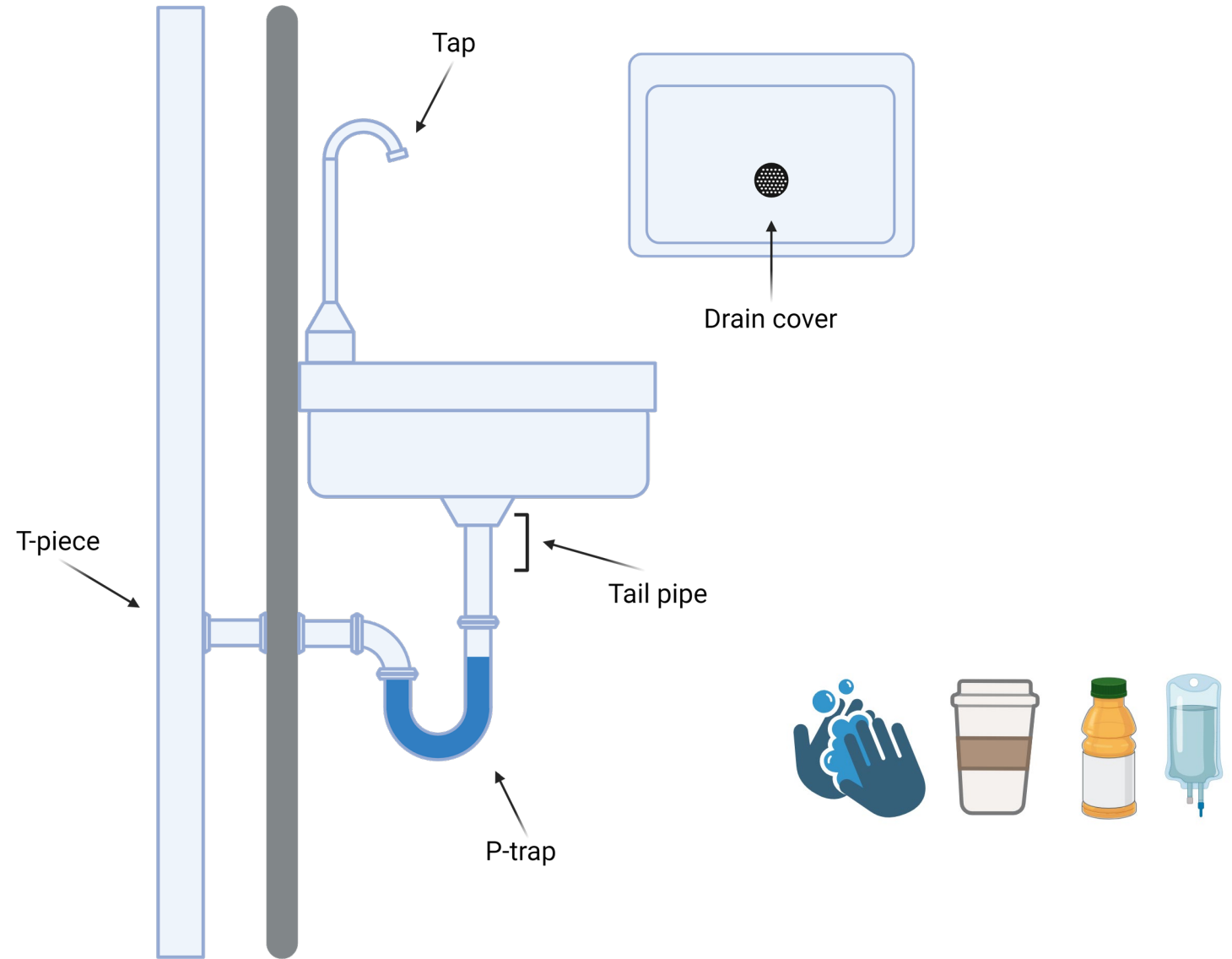
Affiliations + expand

PMID: 37308060 DOI: [10.1016/j.jhin.2023.05.018](https://doi.org/10.1016/j.jhin.2023.05.018)

- 552 ICUs, 80 with no sinks, 472 with sinks
 - HAIs per 1,000 patient days higher in ICUs with in-room sinks: 3.97 vs 3.2
 - Sinks found to be an independent risk factor for HAI: adjusted IRR 1.21, 95% CI 1.01-1.45



Sink Anatomy



Drain Disinfection Struggles

Liquids – Mixed data

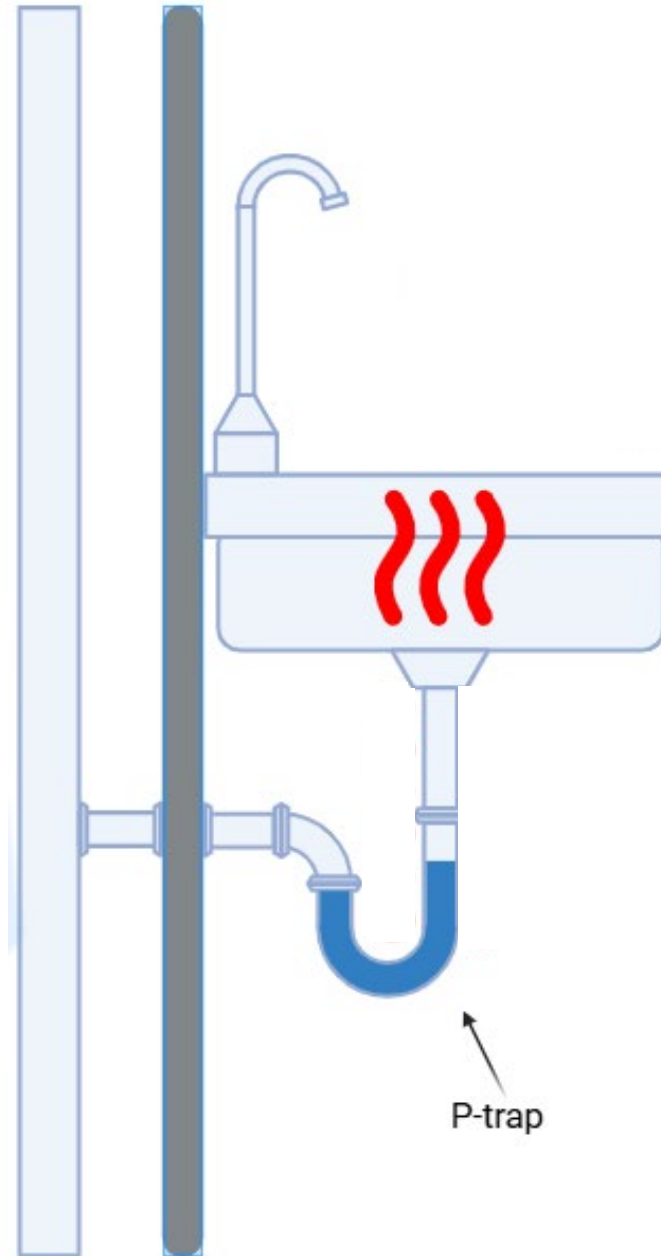
- Bleach, H₂O₂, Peracetic acid, Quats

Materials

- Copper-Silver \$\$\$

Other

- Steam – Impractical
- Ozone – Mixed data
- UV – Mixed data, biofilms

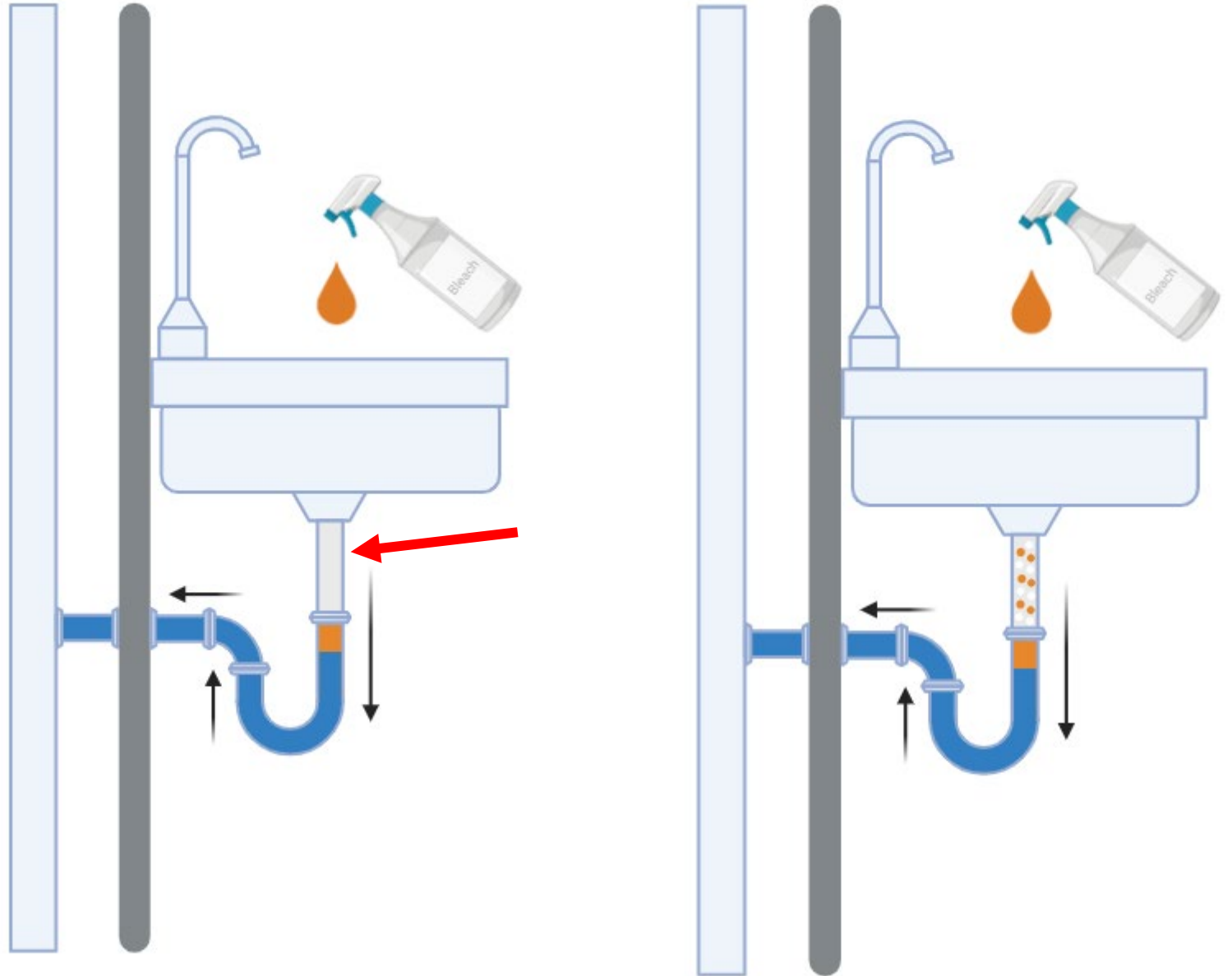


Liquid Disinfectants

- Practical but mixed data
- Diluted due to continuous p-trap dumping
- Tail-pipe missed
- Idea: Foamed disinfectants

2" P-trap = ~500 mL

Complete displacement takes 3-5x or 1.5 to 3 L



Methods



Study Objective and Setting

- Describe timing and frequency of epidemiologically important pathogen (EIP) contamination of in-room handwashing sinks
 - EIP: ESBL and/or Carbapenem resistant *Enterobacterales* + *P. aeruginosa*, *S. maltophilia*, and *Acinetobacter spp.*
- Randomized Controlled Trial
- Setting
 - Renovated general medicine unit, previously Heme/Onc, at Duke University Hospital
 - New distal plumbing

Study Design

- Study Arms
 - Intervention: Application of foamed disinfectant (Virasept [Ecolab]) to sink drains on M/W/F*
 - 3.13% H₂O₂, 0.05% peracetic acid
 - Control: Standard hospital protocol via EVS
 - Daily surface disinfection with nonbleach solutions
- In-room sinks randomized 1:1 Intervention to control
- Micro and infection data was collected from all unit patients during unit stay and 30-days post-unit-discharge
- Items found on or in sinks were recorded



Varghese MM, Torres-Teran MM, Greentree DH, Cadnum JL, Donskey CJ. What is the optimal frequency of sink drain decontamination with a foam disinfectant? *Infection Control & Hospital Epidemiology*. 2024;45(9):1143-1145. doi:10.1017/ice.2024.58

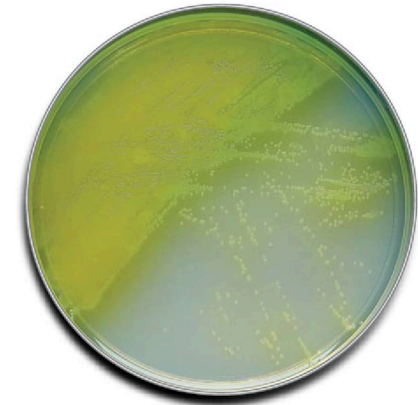
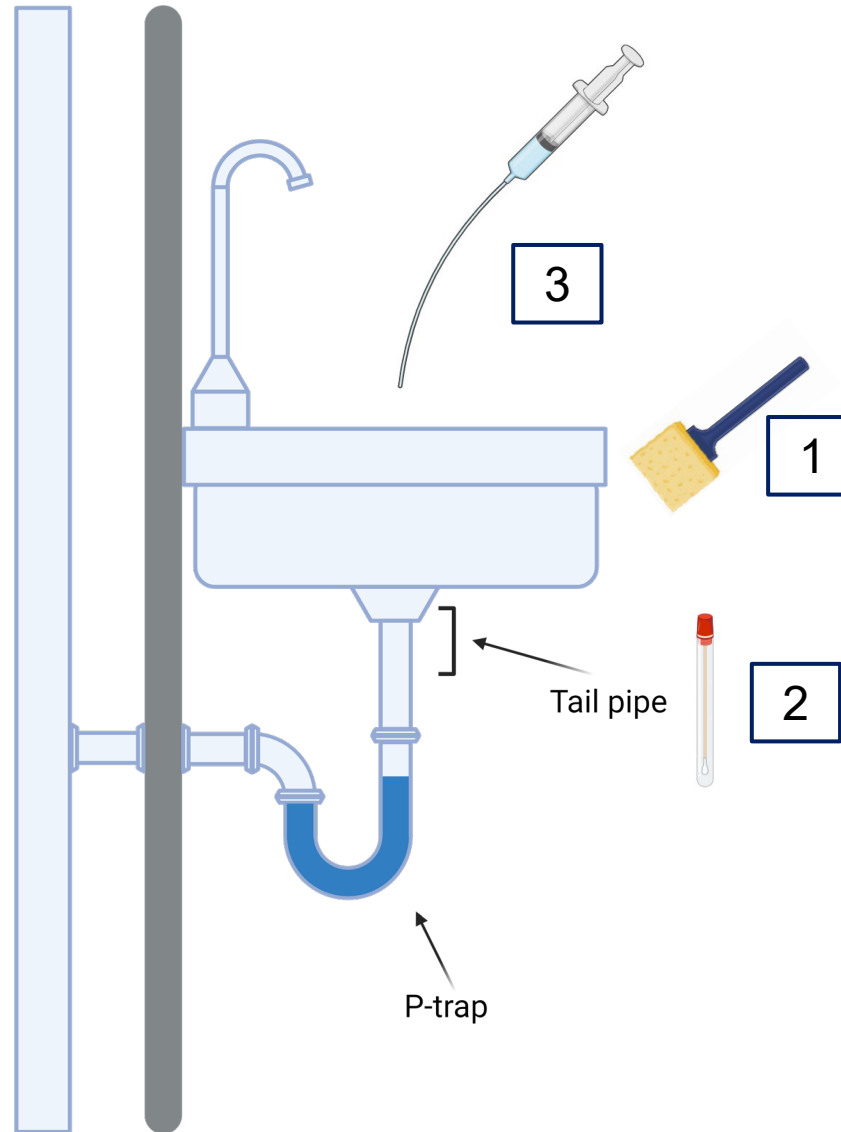
Microbiological Methods

Sink microbiological samples taken weekly

1. Sink Surface
2. Tail pipe
3. P-trap

Cultured on ESBL and Ceftrimide plates

Speciated via 16s sequencing



Duke Center for
Antimicrobial Stewardship
and Infection Prevention

Outcomes

- Primary Outcome: Sink conversion events (SCEs), defined as species-specific-EIP contamination of a sink in which that EIP had not previously been detected, by study arm
- Secondary Outcomes:
 - Genera and species of EIPs recovered by study arm
 - Frequency EIPs identified in patients (via clinical cultures) match organisms identified in sink from same room
 - Items discovered in sinks

Results

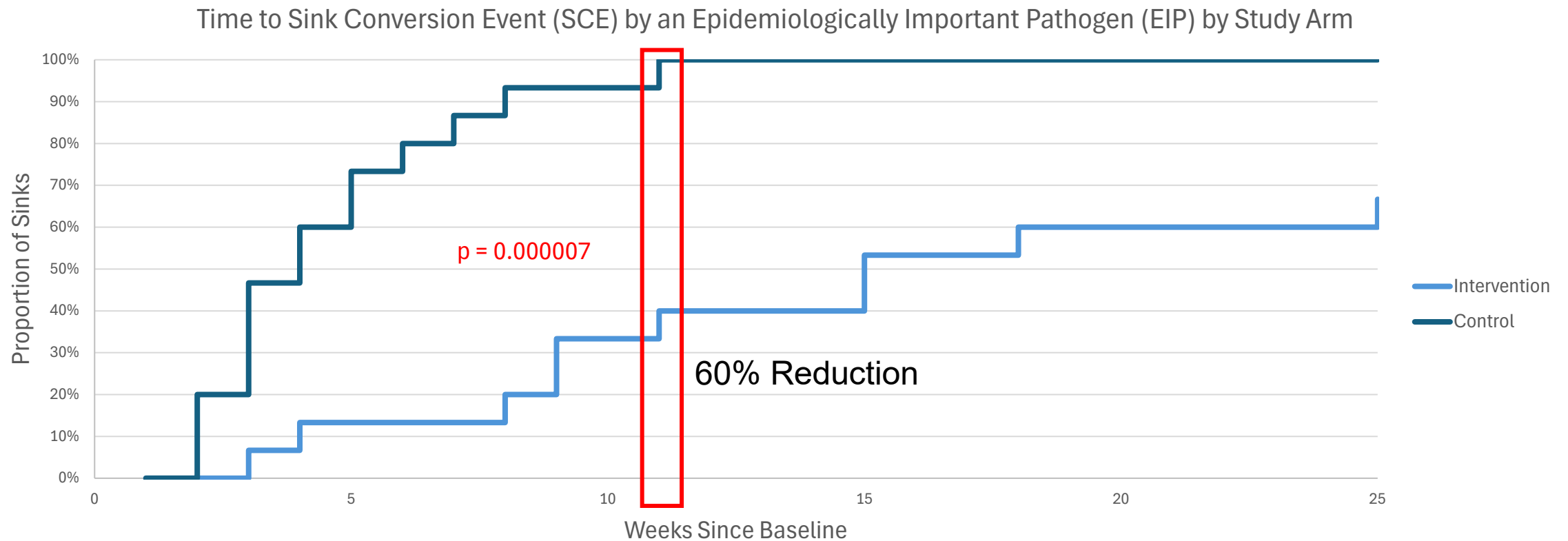


Descriptive Data

- July 2024 – January 2025
 - First sampling was 1 week before patient care began
- 25 weeks, 22 sampling events (holidays)
- 30 sinks, 15 per study arm
- 1,980 microbiological cultures, 990 per study arm

Primary Outcome: SCEs

- 10 SCEs in the intervention arm, 15 in the control arm ($p=0.01$)



EIP Recovery Events by Study Arm

	Overall	Control	Intervention	<i>p</i>
<i>Acinetobacter spp.</i>	135	112	23	<0.01
<i>Burkholderia spp.</i>	1	1	0	0.32
<i>Citrobacter spp.</i>	5	5	0	0.03
<i>Enterobacter spp.</i>	38	37	1	<0.01
<i>Klebsiella spp.</i>	18	12	6	0.16
<i>Pseudomonas spp.</i>	29	24	5	<0.01
<i>Serratia spp.</i>	4	4	0	0.05
<i>Stenotrophomonas spp.</i>	116	98	18	<0.01
Total	346	293	53	<0.01

Patient Data

- 980 patients in the unit over the study period
- 10 patient cultures were positive for study defined EIPs
- 0 patient EIPs matched species or resistance patterns identified in the associated in-room sink

Sink Hygiene

	Total n (%)	Intervention n (%)	Control n (%)
Empty	41 (8)	18 (7)	23 (8)
Items Found	499 (92)	240 (93)	259 (92)
Total	540	258	282

Category	Count n (%)	Description
Food	62 (11)	Food trays, cups, etc.
Hygiene	323 (55)	Bath wipes, wash basins, etc.
Linen & Apparel	40 (7)	Pillows, pillowcases, socks, etc.
Medical Devices	11 (2)	Spirometer, IV pumps, thermometers, etc.
Medical Supplies	128 (22)	General supplies, absorbent pads, gloves, etc.
Uncategorized	21 (4)	Trash bags, flowers, phone, etc.



Discussion



Limitations

- Culture-based sink surveillance may underestimate the presence of EIPs
 - Soap or clinical biowaste → Agitated the p-trap fluid to retrieve biofilm
- No active CRE surveillance performed on unit patients
- No molecular evaluation of isolates
- Only assessed sink contamination once/week

Discussion

- In a renovated general medicine unit, the application of the intervention led to significantly lower SCEs (66% vs. 100%) and EIPs (53 vs. 293) recovered from study sinks, and a reduced cumulative SCE rate compared to control
- Sinks frequently contained clinically relevant equipment and other potential vectors
- These findings highlight the importance of effective sink disinfection and/or sink hygiene and mitigation

Questions?



Supplemental Slides



Gordon *et al.*

JOURNAL ARTICLE

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

Alice E. Kizny Gordon, Amy J. Mathers, Elaine Y. L. Cheong, Thomas Gottlieb, Shireen Kotay, A. Sarah Walker, Timothy E. A. Peto, Derrick W. Crook, Nicole Stoesser

[Author Notes](#)

Clinical Infectious Diseases, Volume 64, Issue 10, 15 May 2017, Pages 1435–1444, <https://doi.org/10.1093/cid/cix132>

Published: 13 February 2017 **Article history** ▾

Table 2. Water Reservoirs Containing Carbapenem-Resistant Organisms^a

Water Reservoir	Studies, No. (N = 32)	References
Drains/drainage systems	17	Peña et al [35], Kotsanas et al [26], La Forgia et al [28], Betteridge et al [7], Leitner et al [20], Wendel et al [29], Breathnach et al [21], Leung et al [24], Snitkin et al [22], Tofteland et al [32], Vergara-López et al [33], Yomoda et al [9], Stjarne Aspelund et al [12], Odom et al [11], Knoester et al [25], Landelle et al [37], Seara et al [34]
Sink surfaces	14	Betteridge et al [7], Wendel et al [29], Knoester et al [25], Podnos et al [23], Wang et al [27], Biswal et al [8], Hong et al [30], Bukholm et al [31], Kouda et al [38], Landelle et al [37], Dewi et al [10], Kaiser et al [13], Ito et al [14], Leung et al [24]
Faucets	8	Odom et al [11], Knoester et al [25], Majumdar et al [17], Pitten et al [36], Hong et al [30], Bukholm et al [31], Alter et al [15], Leung et al [24]
Water	3	Knoester et al [25], Ambroggi et al [18], Bukholm et al [31]
Inflatable hair wash basin	2	Wendel et al [29], Knoester et al [25]
Sensor mixer taps	1	Durojaiye et al [16]
Water/tea dispenser	2	Wong et al [19], Ito et al [14]
Shower/shower equipment	3	Betteridge et al [7], Leung et al [24], Seara et al [34]
Toilet bowl/brush	2	Breathnach et al [21], Kouda et al [38]

^aSome studies had multiple water reservoirs, so categories are not mutually exclusive.

Review > [Infect Control Hosp Epidemiol. 2018 Aug;39\(8\):972-979. doi: 10.1017/ice.2018.138.](#)

Epub 2018 Jun 28.

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

Philip C Carling¹

Affiliations + expand

PMID: 29950189 DOI: [10.1017/ice.2018.138](#)

- 22/23 investigations related to sinks



Typical Suspects

Gram-negatives:

P. aeruginosa,

A. baumannii,

S. maltophilia,

Enterobacterales (*K. pneumoniae*, *E. coli*,
Enterobacter spp.)

