Abstract # 780

Carbapenem-resistant Enterobacteriaceae (CRE) contamination of in-room sinks in a new bed tower

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Abstract (*revised*)

Background: Time from opening of a new bed tower to CRE contamination of patient room hospital sinks is poorly understood.
Methods: A 26-bed patient care unit in a new bed tower was opened on 7/18/2020. Patients admitted to this unit underwent weekly rectal cultures to survey for carbapenemase-producing (CP) CRE. Additionally, infection preventionists performed routine surveillance of all clinical cultures for CP-CRE. In-room sinks were located opposite the patient headwall in each patient room and were cultured monthly beginning 9/14/2020 for 8 months. Samples were obtained from the drain cover, handles, and top of bowl using sponges soaked in neutralizing buffer and processed using the stomacher technique. The tailpipe was sampled using a flocked mini-tip swab soaked in neutralizing buffer; the p-trap water was sampled with sterile tubing attached to a 50mL syringe. All samples were plated on HARDYCHROM-ESBL and KPC Colorex medias and incubated at 37°C for 24 hours. Carbapenem resistance genes (NDM1, KPC, IMP, VIM and OXA48) were detected by multiplex PCR and species were confirmed using MALDI-TOF. Environmental pathogens with intrinsic carbapenem resistance and no detected carbapenem-resistance genes were excluded.
Results: Generally, patients admitted to study rooms were similar across samplings (Table 1). No CP-CRE-positive patients were identified from weekly screening or clinical cultures from the opening of the unit through the first 3 months of sampling. However, on 12/2/2020 a patient's urine culture was positive for KPC-KP On the first sampling we discovered 1 clinically important pathogen (CIP) and 2 environmental pathogens (EP) housing KPC or IMP genes, 5 EPs housing KPC or IMP on the 2nd sampling, 2 EPs housing IMP on the 3rd, 2 CIP and 1 EP housing KPC on the 4th, 1 CIP and 1 EP housing KPC on the 5th, 1 CIP housing KPC on the 6th, 1 CIP and 1 EP housing KPC or NDM on the 7th, and 1 CIP housing KPC on the 8th (Figures 1 and 2). CIPs found *included Enterobacter cloacae complex, Klebsiella pneumoniae* and *Citrobacter freundii*. EPs included *Delftia acidovorans* and *Pseudomonas putida*. All discovered pathogens were transient in sinks, found in only one sampling, except a K. pneumoniae housing the KPC gene that was found 3 days following the arrival of the unit's first CRE positive patient on sample month 4 that persisted to the end of the study.
Discussion: In a new bed tower open for 139 days before evidence of a CRE positive patient, CRE and CRE genes were discovered in in-room sinks in clinically important and environmental pathogens. We observed transient colonization of sink drains with potentially important pathogens during a short observation period and note persistence of a KPC-KP following the housing of the unit's first CRE patient. Observation over longer time is required to determine transient versus persistent colonization and risk factors for persistent drain colonization. Given the ease at which CRE colonizes sinks, new strategies are needed to prevent CRE sink colonization.

Table 1. Patient Characteristics

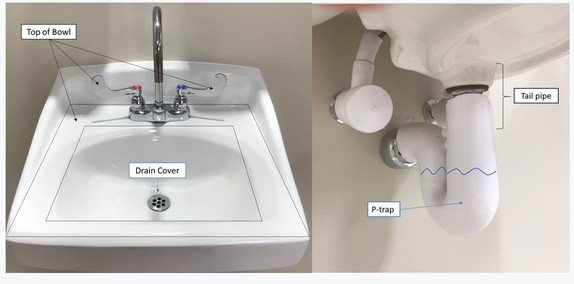
Background

- Time from opening of a new bed tower to CRE contamination of patient room hospital sinks is poorly understood

Methods

- 26-bed patient care unit opened 7/18/2020
- Admitted patients had weekly rectal cultures for CRE
- In-room sinks located opposite the patient headwall
- Sinks cultured monthly beginning on 9/14/20 for 8 months
- Cultures (Fig 1)
  - Drain cover, sink handles, top of bowl – Sponge soaked in neutralizing buffer
  - Tail pipe – Nylon swab soaked in neutralizing buffer
  - P-trap – Sterile tubing and a 50 mL syringe
- All samples were plated on HARDYCHROM-ESBL and KPC Colorex medias and incubated at 37°C for 24 hours
- Carbapenem resistance genes (NDM1, KPC, IMP, VIM and OXA48) were detected by multiplex PCR
- Species were confirmed via MALDI-TOF
- Environmental pathogens with intrinsic carbapenem resistance and no detected carbapenem-resistance genes were excluded

Figure 1. Sample Locations



Results

- Generally, patients in study rooms were similar across samplings (Data not shown)
- On the first sampling we discovered 1 clinically important pathogen (CIP) and 2 environmental pathogens (EP) housing KPC or IMP genes, 5 EPs housing KPC or IMP on the 2nd sampling, 2 EPs housing IMP on the 3rd, 2 CIP and 1 EP housing KPC on the 4th, 1 CIP and 1 EP housing KPC on the 5th, 1 CIP housing KPC on the 6th, 1 CIP and 1 EP housing KPC or NDM on the 7th, and 1 CIP housing KPC on the 8th (Fig 2 and 3).

Figure 2. Pathogens Recovered by Sample Month

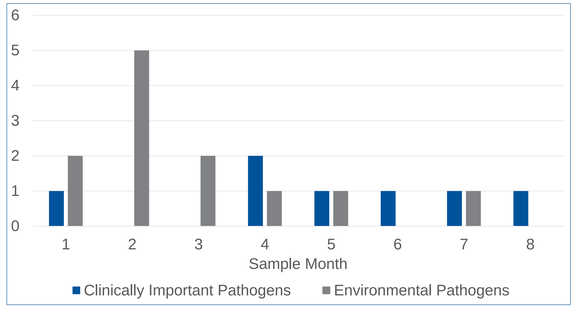
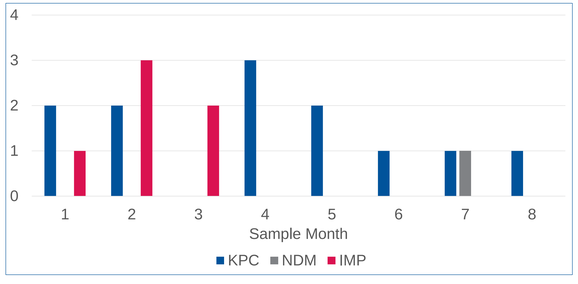


Figure 3. CRE Genes Found by Sample Month



- CIPs*: Enterobacter cloacae complex*, *Klebsiella pneumoniae, Citrobacter freundii*
- EPs: *Delftia acidovorans, Pseudomonas putida*
- First CRE patient admitted to unit on (KPC-KP) 12/4/2020
- All discovered pathogens were transient except one KP-KPC in the room with the first CRE patient (KP-KPC)
  - Found 3 days after positive UC and persisted throughout study

Conclusions

- We observed transient colonization of sink drains with potentially important pathogens during a short observation period and note persistence of a KPC-KP following the housing of the unit's first CRE patient.
- Observation over longer time is required to determine transient versus persistent colonization and risk factors for persistent drain colonization.
- Given the ease at which CRE colonizes sinks, new strategies are needed to prevent CRE sink colonization.