U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

Tap Water Quality and Infrastructure Discussion Guide for Investigation of Potential Water-Associated Infections in Healthcare Facilities

Available from: https://www.cdc.gov/healthcare-associated-infections/php/toolkit/water-management.html

Purpose: For CDC and health departments to use as a discussion guide when consulting with healthcare facilities when there is concern for the transmission of opportunistic pathogens of premise plumbing (OPPP). Patient exposures may be direct, such as inhalation of aerosols, splash, bathing, ingestion, ice use or contaminated devices with water reservoirs. Exposures can also be indirect such as contaminated surfaces, splash, ice use, reprocessed medical devices, drugs, healthcare personnel, and more. Examples of infections might include surgical site, injection site, or bloodstream infections due to nontuberculous mycobacteria; *Pseudomonas aeruginosa* infections among NICU or burn patients and Legionnaires' disease.

1. Drinking Water System Name (Public or Private): _____

2. If Public Water System, EPA ID Number: _____
   To find your EPA ID Number, use SDWIS Search (http://www.epa.gov/enviro/sdwis-search).).

3. Water Source (*check)*:

   ☐ Surface water

   ☐ Ground water

   ☐ Blended surface and ground

   ☐ Private well

4. ☐ Y ☐ N Does the drinking water provider maintain a disinfectant residual? If Yes:

   a. What does the provider use as a secondary disinfectant? Would this be residual in the main public water distribution system?

      ☐ Free available chlorine

      ☐ Monochloramine

   b. What is the disinfectant residual before it enters the building? _____ mg/L (ppm)

5. ☐ Y ☐ N Have there been recent water disruptions such as a water main break or boil water advisory? If yes, briefly describe including dates:

6. ☐ Y ☐ N Does your facility perform supplemental disinfection? If yes (*check all that apply*)
   a. Where in the plumbing system is supplemental disinfection performed?
      ☐ Incoming water (for hot and cold-water distribution)
      ☐ Hot water distribution only
   b. ☐ Other area or point of use, if so describe:
   c. Disinfection strategy (*check all the apply*)
      ☐ Copper/Silver ionization
      ☐ Silver stabilized hydrogen peroxide
      ☐ Free Chlorine (Cl_2, hypochlorite generator, mixed oxidants, bleach injection, etc)
      ☐ Chlorine dioxide (ClO_2)
      ☐ Germicidal Ultraviolet (UV) light
      ☐ Thermal flushing (if so, specify flush temperature, _____°C or _____°F)
      ☐ Point of use filtration. If applicable, list locations and fixture type(s), such as showers or sinks, where point of use filters are used:

      ☐ Other
   d. For each type of chemical disinfectant used, what is the:
      Target residual concentration? _____mg/L
      ☐ Mean or ☐ Median measured concentration? _____mg/L

7. Facility characteristics:
   If investigating a Legionella outbreak there may be other water sources (e.g., cooling towers) associated with the facility see: Legionella Materials (http://www.cdc.gov/legionella/resources/materials.html)) and Legionella Environmental Assessment Form (https://www.cdc.gov/legionella/downloads/legionella-environmental-assessment-p.pdf)

a. Building age in years _____ or year constructed _____

b. Number of buildings of campus:_____

Building name	Original Construction	Later construction	Stories	Sq Feet	Beds	Census	Use
(List main facility first)	Year completed	(Renovation or expansion) From/To or NA	#	ft^2	# or NA	(yr. avg)	List all types of care/or specify other use: I = Inpatient=I O = Outpatient B = Both SP=Sterile Processing BU=Burn unit ICU = Intensive Care Tx = Transplant

c. ☐ Y ☐ N Have there been prior outbreaks associated with water in the facility? If yes, which organism(s) and unit(s)?

d. ☐ Y ☐ N Water storage (e.g., tanks for emergency supply) on site. If yes, Number of storage tanks: ___

e. Number of incoming water entry points: _____

f. ☐ Y ☐ N Does your facility have cooling towers?

g. ☐ Y ☐ N Does your facility have a centralized humidification system?

h. What type of heating system is used for the potable hot water system? (check all that apply)

☐ Instantaneous heaters with no storage

☐ Heaters with hot water storage

☐ Other, describe:

i. ☐ Y ☐ N Recirculating hot water system

If yes, number of recirculating loops _____

☐ Y ☐ N Is temperature monitored at return to hot water tank

j. ☐ Y ☐ N Is there water stored on site (e.g., storage tanks). If yes,

Water storage capacity _____ gallons

Frequency of water turnover in the tank _____ per _____

k. ☐ Y ☐ N Are thermostatic mixing valves used anywhere in patient care areas?

l. Bed occupancy rate: _____

m. Mean cold water temperature at point of use? _____

n. Mean hot water temperature at point of use? _____

o. What is the time to hot water temperature at point of use? _____mins ____ secs

8. Fixtures and devices that use water:

a. Sinks:

☐ Y ☐ N Do any sinks in patient care areas have aerators and flow restrictors in place?

☐ Y ☐ N Do all sinks in patient care areas have drains offset from faucet stream?

☐ Y ☐ N Are there barriers between sinks and adjacent medication preparation areas?

b. ☐ Y☐ N Is a policy followed to keep all patient supplies more than 3 feet away from sinks that do not have barriers? Shower and baths:

☐ Y ☐ N Are bathing areas shared?

☐ Y ☐ N Are showers equipped with hand-held shower heads and hoses?

☐ Y ☐ N If using hand-held shower heads, are these stored so that water drains into the showerhead lying on the shower stall floor?

c. ☐ Y ☐ N Is hydrotherapy equipment (such as pools, whirlpools, whirlpool spas, hot tubs, or physiotherapy tanks) present in the facility? What types of equipment are used:

☐ Y ☐ N Hubbard tanks

☐ Y ☐ N Whirlpool baths

☐ Y ☐ N Large pools (not drained, cleaned and disinfected after each patient use)

☐ Y ☐ N Are baths used for wound debridement?

☐ Y ☐ N Are baths (whirlpools) used in other departments (outside of PT or burn unit)?

☐ Y ☐ N Is a disinfectant residual (such as chlorine, Bromine or Iodine) maintained in all tanks, tubs and pools during patient use?

d. ☐ Y ☐ N Are birthing tanks used in labor and delivery?

e. ☐ Y ☐ N Are decorative water features (such as fountains or fish tanks) present in the facility?

f. ☐ Y ☐ N Are stand-alone humidifiers present in the facility?

g. ☐ Y ☐ N Are ice machines present in the patient care area? If yes, describe all clinical uses of

ice (for example consumption, oral care, swallow studies, ice packs, cooling medications and solutions used in patient care)

h. Hoppers:

☐ Y ☐ N Do all hoppers have a cover that are routinely closed before flushing?

☐ Y ☐ N If no, is there a door that is routinely closed before flushing and that separates patients from the hopper?

i. Toilets:

☐ Y ☐ N Do all toilets have a cover that are routinely closed before flushing?

☐ Y ☐ N If no cover, is there a door that is routinely closed before flushing and that separates patients from the toilet?

☐ Y ☐ N Are toilets present in the ICU?

☐ Y ☐ N Are these swing out toilets in the cabinetry beside the bed?

9. ☐ Y ☐ N Is there a water management program in place? See the Healthcare Facility Water Management Program Check List (https://www.cdc.gov/hai/pdfs/Water-Management-Checklist-P.pdf). If yes, continue; If no stop here.

a. ☐ Y ☐ N Do you have a water management team for your facility?

☐ Y ☐ N Are members identified by name?

☐ Y ☐ N Are roles and responsibilities clearly defined?

b. ☐ Y ☐ N Do you have a flow diagram of the building water system?

c. ☐ Y ☐ N If yes, has the system been assessed for dead legs? ☐ Y ☐ N Do the written facility policies and procedures include the frequency, method, and personnel responsible for cleaning of fixtures and devices that use water?

d. ☐ Y ☐ N Is there a documented environmental hazard analysis?

e. ☐ Y ☐ N Has a Water Infection Control Risk Assessment (WICRA) (https://www.cdc.gov/healthcare-associated-infections/media/pdfs/water-assessment-tool-508.pdf) been performed for the facility for potential water exposures? For the affected unit(s)/ward(s), is there a detailed accounting of these applications/exposures?)

f. ☐ Y ☐ N Is a written summary available for various end uses of water and the ways in which patients, visitors, and staff might be exposed?

g. ☐ Y ☐ N Are control points identified (places where water quality team have identified to be monitored and controlled)?

h. What parameters are being monitored (not all of these may require monitoring)?

Check all that apply

- ☐ Disinfectant residual
- ☐ Oxidation-Reduction Potential (ORP)
- ☐ Dissolved Oxygen (target range: DO above 6.5-8 mg/L)
- ☐ Total dissolved solids (TDS ≤ 500 mg/L)
- ☐ Biological oxygen demand (BOD)
- ☐ Water temperature
  - ☐ Hot water return
  - ☐ Hot water at point of use
  - ☐ Cold water at point of use
- ☐ Heterotrophic plate count/ Total aerobic plate count
- ☐ Turbidity
- ☐ pH
- ☐ other:

i. ☐ Y ☐ N Is there a routine premise plumbing supply flushing program in place?

j. ☐ Y ☐ N Have procedures been put in place to confirm that the program (initially and ongoing) is being implemented as designed (verification)?

k. ☐ Y ☐ N Is your water management program effective in controlling the hazardous conditions throughout the building (validation)? Validation may include testing for the hazard (opportunistic pathogens of premise plumbing), routine clinical surveillance for Legionnaire's disease and other water-associated organisms.

Appendix: Opportunistic Pathogens of Premise Plumbing

If clusters of infections due to these organisms occur, suspect water as a potential source.

Selected Examples:

Gram negative bacteria

- *Pseudomonas aeruginosa*
- *Pseudomonas putida-P. fluorescens*
- *Burkholderia cepcia complex (B. cepacia, B. cenocepacia, at least 8 other genomospecies)*
- *Cupriviadus (Ralstonia) pauculus*
- *Herbaspirillium*
- *Methylobacterium spp.*
- *Ralstonia pickettii, Ralstonia mannitolilytica*
- *Sphingomonas paucimobilis, Sphingomonas mucosissima, other Sphingomonas spp*
- *Stenotrophomonas maltophilia*
- *Acinetobacter baumannii, A. calcoaceticus*
- *Alcaligenes xylosoxidans, A. faecalis,*
- *Aeromonas hydrophila, Aeromonas* spp
- *Elizabethkingia anaophelis, E. meningosepticum*
- *Legionella pneumophia*

Non-fecal coliforms

- *Enterobacter cloacae*
- *Klebseilla spp*
- *Pantoae aggloerans*
- *Rahnella aquatilis*
- *Serratia liquifaciens, Serratia marcescens*

Nontuberculous mycobacteria (NTM or Environmental Mycobacteria)

- *M. abscessus clade (M. abscessus, M. bolettii, M. massiliense)*
- *M. chelonae*
- *M. mucogenicum clade (M. mucogenicum, M. phociacum)*
- *M. fortuitum clade (M. fortuitum, M. cosmeticum, mageritiense, M. porcinum, M. septicum)*
- *M. immunogenum*
- *M. smegmatis clade (M. goodii, M. wolinskyi)*
- *M. aurum*
- *M. simiae*
- *M. avium complex (M. avium, M. intracellulare, M. chimaera, M avium ss hominissuis, M. columbiense)*
- *M. scrofulaecuem*
- *M parascrofulaceum*
- *M. xenopi*
- *M. arupense*
- *M. kansasii*
- *M. haemophilum*
- *M. nonchromogenicum clade (M. nonchromogenicum, M. triviale, M. terrae)*
- *M. gordonae* (only among patients with severe immune deficiency)

Other bacteria/actinomyces

- *Microbacterium spp*
- *Tsukamurella spp*
- *Rhodococcus equi, Rhodococcus spp*
- *Gordonae spp*

Fungi

- Yeasts (e.g. *Candida parapsilosis, C. tropicalis)*
- *Aspergillus fumigatus, A. niger*
- *Fusarium spp*
- *Exophiala spp.*

Protozoa

- *Acanthameba spp*
- *Vermamoeba vermiformis*
- *Naegleria spp*