



Environmental Factors and Ventilation to Prevent Infectious Disease Spread in Healthcare Facilities

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Disclosure Statement:

“The speakers do not have a financial or non-financial relationship with a commercial interest that would create a conflict of interest with this presentation.”

OBJECTIVES:

- Identify at least one(1) environmental element that precipitates disease outbreaks in various healthcare settings
- Identify measures to prevent transmission of disease in various healthcare settings

Knowledge Check:

What are some environmental factors that play a role in disease outbreaks?



Answers:

- Water
- Waste Management
- Food
- Air Quality

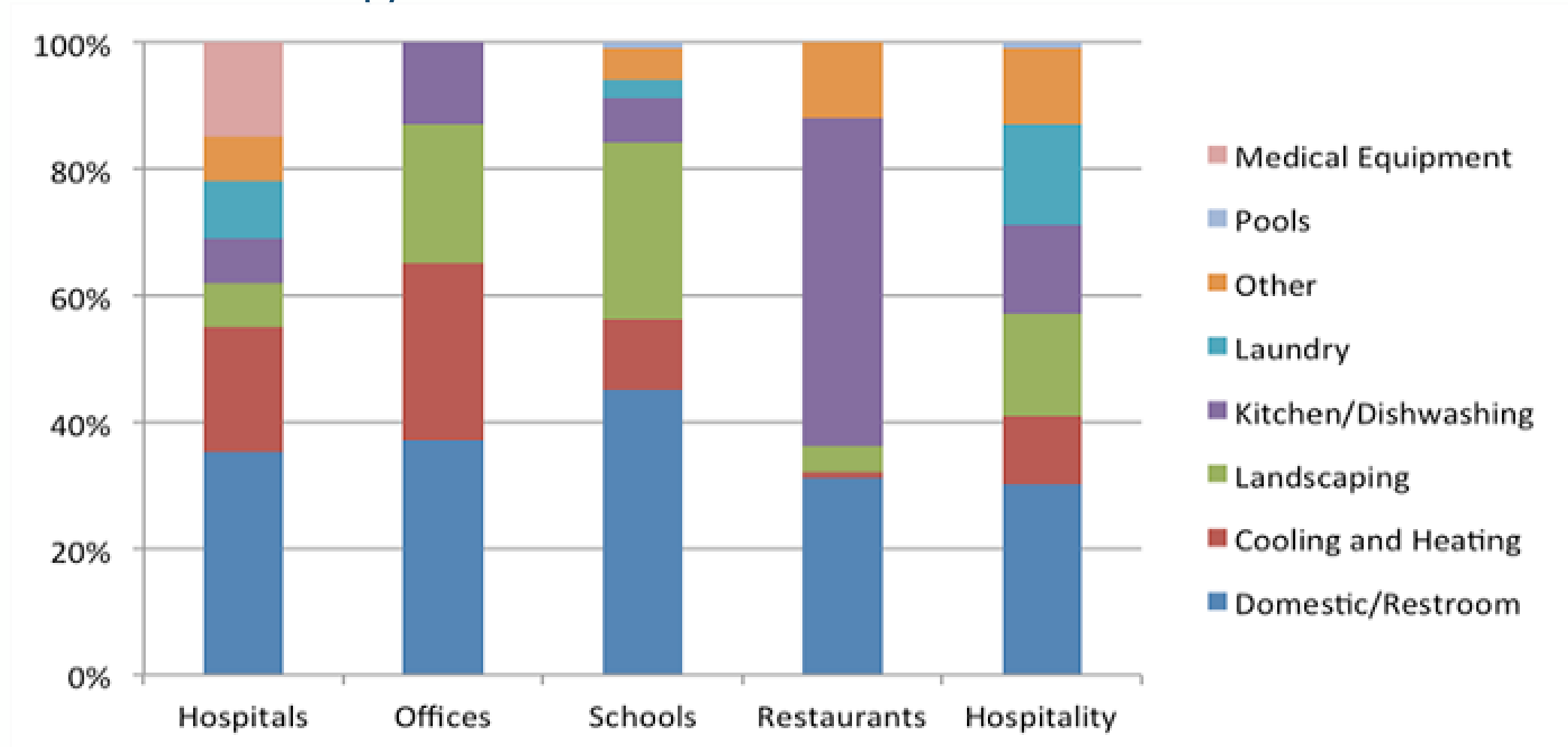




Water

How does it influence disease outbreak?

Water Usage in Commercial and Institutional Facilities



Potential Transmission Routes from Water

- Improperly processed medical devices
- Improper tap water use in respiratory care
- Using water with microbes, nutrients, heavy metals, organic chemicals, oil and sediments for immunocompromised patients
- Water droplets and splatter from shower heads and toilets
- Preparing injections and medication near sinks

Knowledge Check:

What are some common waterborne illnesses?

Possible Answers:

- *Cryptosporidiosis (Cryptosporidium)*
- *Escherichia coli O157:H7 Infection (E. Coli)*
- *Giardiasis (Giardia)*
- Norovirus
- *Pseudomonas Pneumonia*
- *Legionellosis (Legionella)*

Legionella

- Showerheads and sink faucets
- Cooling towers
- Decorative fountains and water features
- Hot tubs
- Hot water tanks and heaters
- Large, complex plumbing systems



Resources

[Water Management Program Template](#)

[Water Management Program \(WMP\) Evaluation Tool](#)

[Water Management Program Evaluation Tool – Excel supplement](#)

Legionnaires' Disease Risk Communication Toolkit

[Complete Toolkit - All Modules Included](#)

[Foundational Chapters](#)

[Healthcare Facilities Module](#)

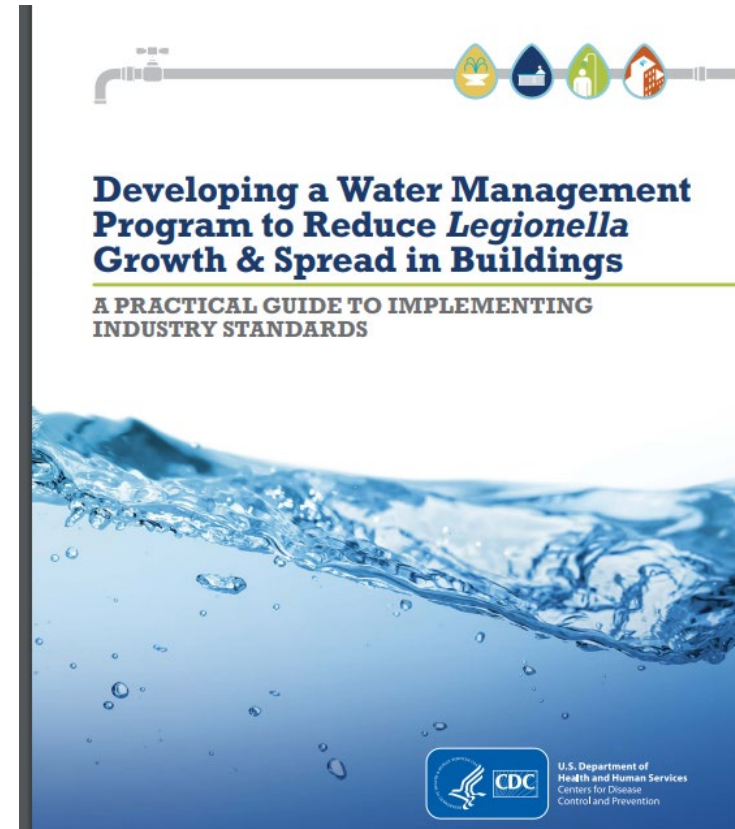
[Congregate Residential Facilities Module](#)

[Hotels and Hospitality Facilities Module](#)

[Community Settings Module](#)

[Routine Environmental Testing Results Module](#)

[Appendix](#)



Water Management Plan Toolkit

The toolkit includes:

- A simple yes or no worksheet to determine if an entire building or parts of it are at increased risk for growing and spreading *Legionella*
- A basic review of the elements of a *Legionella* water management program
- Scenarios describing common water quality problems and examples of how to respond to them to reduce the risk for *Legionella*
- Special sections and considerations for those who work in healthcare facilities

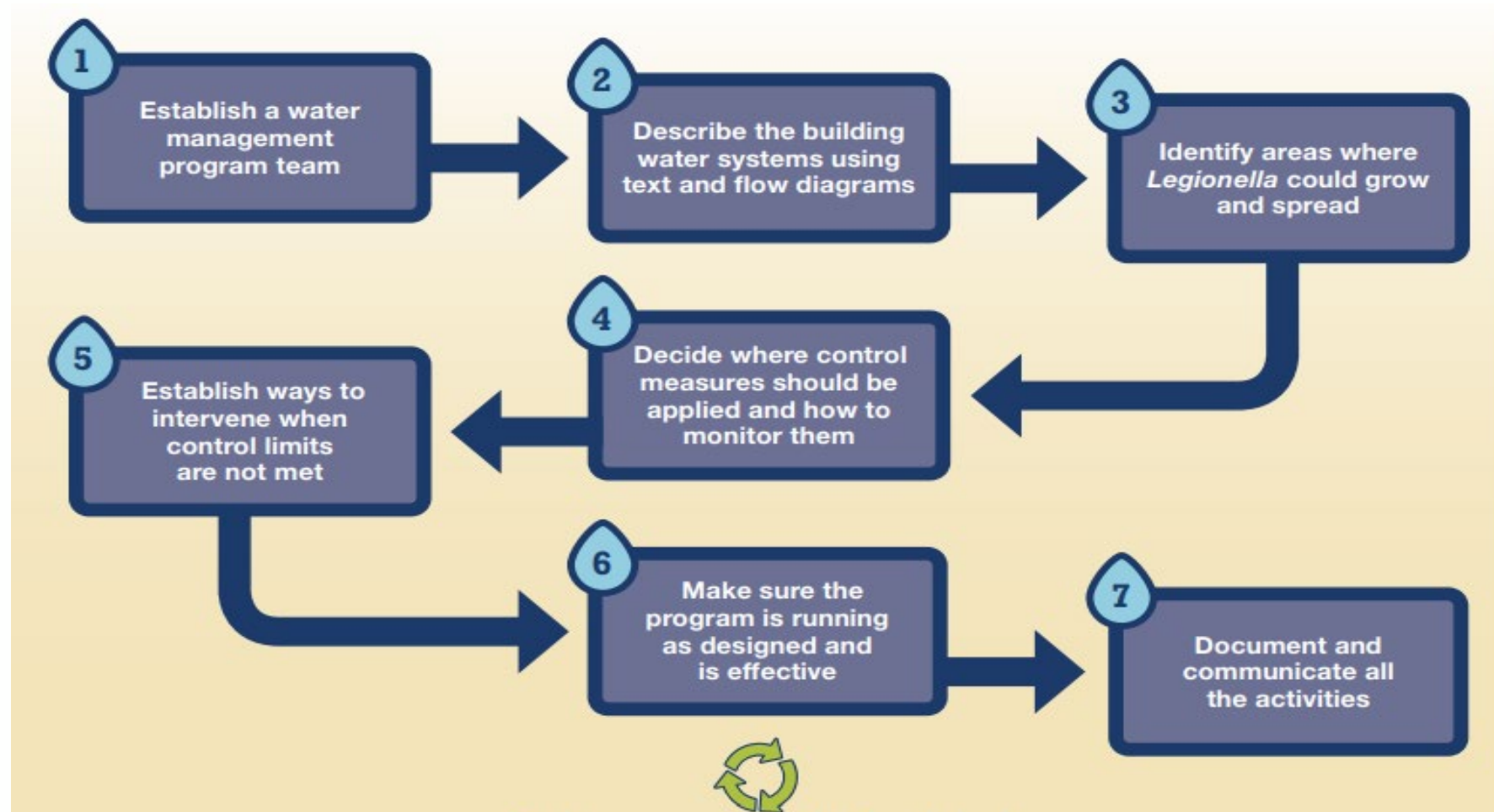
Establish a Water Management Team



Water Management Team Members

- Building manager/administrator
- Risk and quality management Staff
- Safety Officers
- Regulatory standards expert
- Clinician with IP expertise
- Maintenance or engineering employees
- Equipment or chemical suppliers
- Contractors/consultants (water treatment professionals)
- Public health professionals (epidemiologists, microbiologists, environmental health officers)

Water Management Plan



When to Perform Water Plan Review

- Annually
- When data review shows that control measures are consistently outside of control limits
- When major maintenance or water service changes occur, such as:
 - New construction
 - Equipment changes (e.g., new hot tub chlorinator pump)
 - Changes in treatment products (e.g., disinfectants)
 - Changes in water usage (e.g., high and low)
 - Changes in the municipal water supply

Other Triggers for Water Management Review

- One or more cases of disease are thought to be associated with your system(s)
- Changes occur in applicable laws, regulations, standards, or guidelines
- Update the process flow diagram, associated control points, control limits, and corrective actions
- Update the written description of your building water systems
- Train those responsible for implementing and monitoring the updated program



Waste Management

How does it influence disease outbreak?

Knowledge Check:

What are some types of medical waste?

Answers: Types of Healthcare Waste

- Infectious Waste
- Pathological Waste
- Sharps Waste
- Chemical Waste
- Pharmaceutical Waste
- Chemotherapy Waste
- Radioactive Waste
- Non-hazardous/General Waste



Key Facts

- 85% = General/Non-hazardous waste
- 15% = Hazardous Material waste
- An estimated 16 billion injections annually
- Open incineration can result in emissions of organic pollutants and particulate matter
- Management of health care waste can prevent disease outbreaks and adverse health outcomes

Potential Infections related to Healthcare Waste

Type of infection	Examples of causative organisms	Transmission vehicles
Gastroenteric infections	Enterobacteria, e.g., <i>Salmonella</i> , <i>Shigella</i> spp., <i>Vibrio cholerae</i> , <i>Clostridium difficile</i> , helminths	Feces and/or vomit
Respiratory infections	<i>Mycobacterium tuberculosis</i> , measles virus, <i>Streptococcus pneumoniae</i> , severe acute respiratory syndrome (SARS)	Inhaled secretions, saliva
Ocular infection	Herpesvirus	Eye secretions
Genital infections	<i>Neisseria gonorrhoeae</i> , herpesvirus	Genital secretions
Skin infections	<i>Streptococcus</i> spp.	Pus
Anthrax	<i>Bacillus anthracis</i>	Skin secretions
Meningitis	<i>Neisseria meningitidis</i>	Cerebrospinal fluid
Acquired immunodeficiency syndrome (AIDS)	Human immunodeficiency virus (HIV)	Blood, sexual secretions, body fluids
Hemorrhagic fevers	Junin, Lassa, Ebola, and Marburg viruses	All bloody products and secretions
Septicemia	<i>Staphylococcus</i> spp.	Blood
Bacteremia	Coagulase-negative <i>Staphylococcus</i> spp. (including methicillin-resistant <i>S. aureus</i>), <i>Enterobacter</i> , <i>Enterococcus</i> , <i>Klebsiella</i> , and <i>Streptococcus</i> spp.	Nasal secretion, skin contact
Candidemia	<i>Candida albicans</i>	Blood
Viral hepatitis A	Hepatitis A virus	Feces

Key Elements in Waste Management

- Review state and national standards
- Implement/review your facility waste management plan
- Promote practices to reduce waste volume
- Select safe environmentally friendly products
- Train Staff
- Perform QI audits

Waste Management

Principle Steps:

- Generation
- Segregation/Separation
- Collection
- Transportation
- Storage
- Treatment
- Final disposal



Treatment of Medical Waste

- Chemical Disinfection
- Grinding/Shredding/Disinfection
- Microwave/radio wave treatments
- Disinfection/encapsulation
- Steam exposure for up to 90 minutes at 250° F
- Incineration

Food

Illness outbreaks and measures of prevention

Knowledge check

How many people in the United States get sick from foodborne illness annually?

- A. 10 million
- B. 32 million
- C. 48 million

Answer:

How many people get sick from foodborne illness annually?

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Top 5 Germs Causing Illness From Food Eaten in the United States

- Norovirus
- Salmonella (*non-typhoidal*)
- Clostridium perfringens
- Campylobacter
- Staphylococcus aureus



Food Safety Tips



STEP 1



CLEAN



STEP 2



SEPARATE



STEP 3



COOK



STEP 4



CHILL



Knowledge check

Bacteria can multiply rapidly in food. What is the temperature “Danger Zone” for foods?

- A. 50-150 degrees
- B. 60-160 degrees
- C. 40-140 degrees

Answer:

- A. 50-150 degrees
- B. 60-160 degrees
- C. 40-140 degrees**

Role of Public Health in Prevention and Response to Foodborne Illnesses:

- Collaborate with partners such as Food and Drug Administration, U.S. Department of Agriculture's Food Safety and Inspection Service, state and local health departments, as well as the food industry
- Utilize the coordinated DNA fingerprinting network for foodborne illness-causing bacteria to detect outbreaks
- Track the occurrence of foodborne illnesses
- Facilitate and lead outbreak investigations

Role of Public Health in Prevention and Response to Foodborne Illnesses:

- Use whole genome sequencing to connect illnesses by showing which bacteria making people sick are most alike genetically
- Analyze epidemiological data to connect illnesses to specific foods and settings
- Target prevention measures to reduce illness and death
- Provide data and analyses to inform food safety action and policy



Air Quality

Ventilation as a measure to prevent the transmission of disease

Knowledge check

What is the definition of ventilation?

CDC Definition

For the purpose of this presentation, “ventilation” includes:

- Indoor air movement and dilution of viral particles through mechanical or non-mechanical (also called natural) means
- Filtration through central heating, ventilation and air conditioning (HVAC) systems and/or in-room air cleaners (portable or permanently mounted)
- Air treatment with Ultraviolet Germicidal Irradiation (UVGI) systems (also called Germicidal Ultraviolet or GUV)

Ventilation vs Filtration

Ventilation

Process of supplying or removing air from a space by natural or mechanical means for purposes that include control of air contaminant levels.

Filtration

Removes particles from the air within a space or from the air that is recirculated by centralized or distributed HVAC system components and/or in-room air cleaners.

Good ventilation, along with other preventive actions (vaccination, avoiding contact with those who are sick, hand hygiene), can help prevent you and others from getting and spreading COVID-19 and other respiratory viruses.

Learn ways to improve ventilation in healthcare settings with the ventilation assessment tool:

[Ventilation Assessment Tool | ASHE](#)

“How much ventilation is enough?”

Parameters will vary depending on the healthcare environmental setting such as clinic, surgical suite, critical care, corridors, etc.

As an example, a surgical suite may require 20 air changes per hour.

Facilities management and engineering staff can assist with calculating the acceptable value for the specific space.

Three Components of Ventilation

Ventilation systems provide 3 major components:

- 1) Quantity- amount of air supplied or removed from a specific space.
- 2) Quality- the relative “cleanliness” of the air.
- 3) Flow- the direction of air movement from a space relative to another.

Scenario: Patient with known measles diagnosis arrived and is seated in clinic waiting area.

- Mask patient and move to an airborne infection isolation room (AIIR).
- If AIIR room not available, transfer ASAP to facility with AIIR available.
- Until transfer, mask patient in private room with door closed.
- The patient should be in a room with exhaust recirculated with high-efficiency particulate air (HEPA) filtration.
- After the patient leaves the room, it should remain vacant (up to 2 hours) to allow 99.9% of airborne contaminant removal.

Portable Air Cleaners

Center for Medicare/Medicaid Services allows nursing homes to apply for available funding to improve in-person visitation.

Purchases may include indoor portable fans or portable air cleaners.

Limit \$3,000 per facility.

Contact:

HSS-CMP-Fund@la.gov or

Eryn.Dopson@la.gov for information or application.





Survey link: <https://laredcap.opd.dhh.la.gov/surveys/?s=JRMFEAJHAMYLJWJE>

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