

Waterborne Pathogens: Standard Operating Procedure/Guideline (SOP/SOG)

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Preface

The importance of emergency preparedness and response cannot be overstated in today's rapidly changing world. Natural, human-caused, and technological hazards have the potential to disrupt communities, compromise hospitals, and pose significant risks to public health. Waterborne pathogens are one hazard which pose a major public health threat with the potential to cause outbreaks of illnesses, such as legionella, cholera, typhoid fever, and cryptosporidiosis, resulting in severe illnesses, hospitalizations, and even death (World Health Organization, 2019).¹

About 7.15 million waterborne infections are reported annually, resulting in 601,000 Emergency Department (ED) visits, 118,000 hospitalizations, 6,630 fatalities, and incurring US \$3.33 billion in direct healthcare costs in the United States of America.(Centers for Disease Control and Prevention, 2020).² Vulnerable populations, such as children, the elderly, and individuals with compromised immune systems, are particularly susceptible to waterborne illnesses.

Contaminated water sources can introduce pathogens into the human body through ingestion, inhalation, or contact, leading to the spread of diseases within communities. Common waterborne pathogens include bacteria, viruses, parasites, and harmful algal blooms. Waterborne pathogens of human and animal fecal origin include a high number of viruses, bacteria, and parasitic protozoa (World Health Organization, 2019).¹ Naturally occurring microorganisms can be pathogenic to humans, such as various species of *Vibrio*, causing gastroenteritis, diarrhea, and septicemia, *Pseudomonas aeruginosa* leading to skin and ear infections, *Legionella pneumophila* causing Legionnaire's disease, and amoebae associated with encephalitis (World Health Organization, 2019).¹

Weather is another key factor contributing to waterborne infection outbreaks since contaminants may be introduced into clean water sources through runoff, heavy rainfall patterns, or flooding events (Rose, 2015).³ Inundations, droughts, severe storms, changes in precipitation patterns, rising temperatures, and sea level variations can impact water's chemical, biological, and physical components (World Health Organization, 2019).¹ Environmental degradation and climate change can increase the distribution and patterns of human exposure to waterborne pathogens (World Health Organization, 2019).¹

Infrastructure, including the chemical coating of pipes and the architecture of former pipe systems, play a significant role in either enhancing or inhibiting the growth of pathogens in drinking water systems. (Rose, 2015).³ In addition, failures within water system procedures, such as insufficient water treatment measures and interruptions in treatment, can result in waterborne infection outbreaks caused by various pathogens, including *Salmonella*, *Campylobacter*, *Shigella*, *E. coli* O157:H7, *Cryptosporidium*, *Giardia*, and *Norovirus* (Rose, 2015).³

Water treatment facilities employ various processes to remove or inactivate contaminants to mitigate waterborne hazards. Constant monitoring and testing of water sources also play a vital role in identifying potential hazards and ensuring water quality.

Legionella bacteria are found naturally in freshwater environments, such as lakes and streams (Center for Disease Control and Prevention).¹⁴ However, *Legionella* bacteria has become a health concern as they can colonize within deep infrastructure outlets of hospital water distribution systems (Decker, Palmore, 2014).¹⁵ Studies of hospital water contamination and waterborne infections have shown an increase in culture positivity during the summer and early fall seasons as *Legionella* bacteria thrive in a range temperature of 20°C to 50°C (Decker, Palmore, 2014).¹⁵ The mortality rate of Hospital- acquired Legionnaires disease is approximately 32%; more than that of community-acquired infection, likely due to the underlying comorbidities of hospitalized patients . Vulnerable groups for Legionnaires disease in hospitals are immunologically compromised patients, advanced age patients and chronic patients with lung disease (Decker, Palmore, 2014).¹⁵

By acknowledging a hospital's unique characteristics this emergency preparedness plan aims to provide a comprehensive framework that addresses the specific needs and risks associated with waterborne hazards.

In association with the Centers for Disease Control and Prevention (CDC) guidelines and best practices, the Emergency Preparedness Plan addresses prevention, detection, and response to waterborne pathogens. It incorporates a comprehensive SOP/SOG to ensure effective coordination, communication, and implementation of emergency procedures. By sharing knowledge, resources, and the expertise of dedicated healthcare professionals, a hospital can strengthen their collective ability to respond to waterborne emergencies, emphasizing the commitment of the hospital to the health and safety of our communities.

Effective emergency preparedness requires ongoing evaluation, refinement, and collaboration. As such, this plan will be regularly reviewed, updated, and tested to ensure its continued effectiveness in addressing waterborne pathogens and safeguarding public health.

Signature Page

LETTER OF APPROVAL/SIGNATURE PAGE

By signing below, I approve and will fully support the implementation of the Waterborne Pathogen Prevention Plan in the Hospital as outlined below.

Hospital President and Chief Executive Officer **Date**

Chief Quality Officer for Quality & Patient Safety **Date**

Chief Nursing Executive **Date**

Infection Prevention & Control Director **Date**

Emergency Management Director **Date**

Base Plan

1. Mission Statement

2. Statement of Purpose

The purpose of this plan is to help safeguard the health and well-being of patients, staff, and the community by addressing waterborne pathogens; specifically focusing on cases of Legionnaires' disease affecting the area. This plan is designed to implement CDC-recommended guidelines, establish a risk-based approach for mitigation and response, and develop a comprehensive Standard Operating Procedure/Guideline (SOP/SOG). By focusing on the prevention, detection, and management of waterborne diseases, particularly Legionnaires' disease, this plan aims to ensure the highest level of safety and quality of care for all individuals within the hospital's jurisdiction.

Implementation of this plan will help ensure that proactive measures are in place to monitor, mitigate, and respond effectively to waterborne pathogens. By adhering to CDC guidelines and implementing a risk-based approach, this plan seeks to minimize the risk of waterborne diseases, maintain a safe water supply, and protect all individuals within the hospital.

3. Authorities

- Emergency Preparedness Coordinator:
 - Responsible for overseeing the development, implementation, and maintenance of the emergency preparedness plan.
 - Ensures compliance with regulatory requirements and coordination with relevant agencies.
 - Facilitates training and drills to enhance preparedness and response capabilities.
- Incident Command Structure: (Refer to Annex 3)
 - Establishes a clear chain of command during emergencies to ensure effective decision-making and communication during emergencies.
 - Defines roles and responsibilities of key personnel involved in emergency response, including:

Role	Responsibility
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Incident Commander	Overall responsible for managing the emergency response operations.
Safety Officer	Monitors and addresses safety hazards during response activities.
Operations Section Chief	Oversees operational activities, including monitoring water quality and implementing mitigation measures.
Planning Section Chief	Develop strategies and action plans for addressing waterborne pathogens.
Logistics Section Chief	Coordinates resource management, including equipment and supplies needed for response efforts.
Finance/Administration Section Chief	Manages financial aspects, documentation, and administrative support during emergencies.

- Relevant Regulatory Agencies:
 - [Centers for Disease Control and Prevention \(CDC\)](#): Provides guidelines and recommendations for waterborne disease prevention and response. Compliance with their directives and requirements is essential for effective emergency preparedness.
 - [Environmental Protection Agency \(EPA\)](#): Sets regulations for water quality standards and oversees water treatment processes.
- State Agencies (Connecticut):
 - [Connecticut Department of Public Health \(DPH\) Waterborne Disease agency](#): Establishes state-specific guidelines and regulations related to waterborne pathogens and emergency preparedness.
 - [Connecticut Department of Energy and Environmental Protection \(DEEP\)](#): Monitors water quality and provides guidance for water treatment and distribution systems.
- Local Agencies:
 - [Local Health Departments](#): Collaborate with hospitals to ensure compliance with local regulations and provide support during emergency response.
 - [Water Utilities](#): Responsible for monitoring and maintaining the water supply infrastructure to prevent waterborne disease outbreaks.

4. Definitions and Abbreviations

Term	Definition
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Centers for Disease Control and Prevention (CDC)	Is the nation's leading science-based, data-driven service organization that protects America from health, safety, and security threats, both foreign and in the U.S (CDC).(5).
Waterborne	Carried by or through a body of water (Walter, 2008).(6).
Runoff	Water from rain, melting snow, or liquid from an industrial or farming process, that flows into water sources such as streams, lakes, and rivers (Walter, 2008).(6).
Virus	An infectious microbe consisting of a nucleic acid (DNA or RNA) surrounded by a protein coat. Viruses cannot replicate alone; they infect cells and use components of the host cell to replicate (Segre, 2023).(7).
Bacteria	Group of unicellular microorganisms; found almost everywhere on Earth; they are vital to the planet's ecosystems. Bacteria have cell walls, but lack organelles and nucleus (National Institute of Health, 2023).(8).
Parasitic protozoa	Single-celled organisms; they have the ability to invade humans and other animals' tissues and cells, causing a range of medical outcomes. These microorganisms are found in numerous habitats and can be acquired via fecal-oral transmission (American Type Culture Collection).(9).
Emergency Department (ED)	A hospital facility that is staffed 24 hours a day, 7 days a week, and provides unscheduled outpatient services to patients whose condition requires immediate attention and care (CDC).(16).
Salmonella	Salmonella refers to a group of bacteria that can cause foodborne illness in humans and animals. The genus Salmonella consists of numerous serotypes, with Salmonella enterica being the most common serotype associated with human infections (CDC, 2021).(13).
<i>Legionella pneumophila</i>	<i>Legionella pneumophila</i> is a gram-negative bacterium that is primarily responsible for causing Legionnaires' disease; a severe form of pneumonia. It was first identified in 1977 during an outbreak of pneumonia at a Legionnaires' convention in Philadelphia, hence the name (CDC, 2022).(12).
Pathogen	A pathogen refers to a biological agent, such as a microorganism or virus, which can cause disease in its host. Pathogens have the ability to invade and multiply within a host's body, leading to various infections and illnesses (Merriam-Webster, n.d).(11).

5. Communication Plan

Internal Communication: Emergency Preparedness and Standard Operating Procedure/Guideline (SOP/SOG) Development

1. Objective

The internal communication plan aims to ensure effective communication within the Hospital during the implementation of the Emergency Preparedness Plan addressing waterborne pathogens and the development of a Standard Operating Procedure/Guideline (SOP/SOG). The plan seeks to provide clear and frequent updates to all staff members, both clinical and non-clinical, to enhance preparedness, promote understanding, and facilitate a consistent and coordinated response.

2. Key Messages

- Importance of Emergency Preparedness: We emphasize the significance of being prepared to address waterborne pathogens and potential outbreaks by implementing effective measures and developing robust SOP/SOG, the safety of patients, staff, and community members is ensured.
- Commitment to Clear Communication: The Hospital is committed to providing clear and frequent communication to all staff members. Transparency, collaboration, and engagement are important for successfully managing waterborne pathogens and emergency situations.
- Collaboration and Teamwork: The expertise and input from all the diverse staff members is valued. Collaboration and teamwork across departments is essential to develop comprehensive SOP/SOG and implement effective strategies to intercept and manage waterborne pathogens.
- Staff Training and Education: Staff training and education is prioritized with the intention to enhance awareness and knowledge about waterborne pathogens, prevention measures, and the proper implementation of SOP/SOG. By equipping staff with the necessary skills, consistent and coordinated response is ensured.

3. Communication Strategies

Regular Updates:

- Email Updates: Send blast email updates to all staff members, providing important information, progress updates, and reminders related to the Emergency Preparedness Plan and SOP/SOG development.
- Intranet and Online Resources: Maintain a dedicated section on the intranet with relevant documents, guidelines, protocols, training materials, and FAQs related to waterborne pathogens and emergency preparedness.

- Newsletters: Distribute periodic newsletters highlighting key milestones, successes, and best practices related to waterborne pathogens management and emergency preparedness.
- Where indicated, ensure that messages are also available to patients and their families and that messaging is fully accessible using a variety of resources.

Training and Workshops:

- Training Sessions: Conduct training sessions and workshops to educate staff members about waterborne pathogens, prevention measures, early detection, and the proper implementation of SOP/SOG. Utilize a combination of in-person and online training formats to accommodate different schedules and preferences.
- Expert Presentations: Invite subject matter experts to deliver presentations and share their knowledge on waterborne pathogens, outbreak management, and emergency response protocols.

Departmental Meetings and Huddles:

- Departmental Updates: Encourage department leaders to provide regular updates during departmental meetings, addressing specific concerns, challenges, and progress related to waterborne pathogens and emergency preparedness.
- Daily Huddles: Incorporate dedicated time during daily huddles for quick updates, reminders, and sharing of best practices related to waterborne pathogens and SOP/SOG implementation.

Feedback and Suggestions:

- Open Communication Channels: Establish open communication channels, such as suggestion boxes, dedicated email addresses, or online forums, to encourage staff members to share their feedback, suggestions, and concerns regarding waterborne pathogens and emergency preparedness.
- Feedback Incorporation: Actively listen to staff feedback and incorporate valuable suggestions into the development and refinement of SOP/SOG and emergency preparedness strategies.

Visual Communication and Signage:

- Posters and Signage: Display visually appealing posters and signage throughout the hospital premises, highlighting key messages, prevention measures, and important contact information related to waterborne pathogens and emergency response.
- Digital Screens: Utilize digital screens strategically placed in common areas to display relevant updates, reminders, and educational materials.

Recognition and Appreciation:

- Recognition Programs: Implement recognition programs to acknowledge and appreciate staff members who demonstrate outstanding commitment, adherence to protocols, and active participation in waterborne pathogens management and emergency preparedness efforts.

- Peer-to-Peer Recognition: Encourage staff members to recognize and appreciate their colleagues' contributions through peer-to-peer recognition platforms or initiatives.

Additional Communication Points

- Communicate infection control processes/guidelines, including Water Infection Control Risk Assessment (WICRA) for Healthcare Settings.
- Share the status of Personal Protective Equipment (PPE) supply and instructions on proper usage.
- Inform staff about testing capabilities, options, and criteria for testing.
- Communicate clinical processes/protocols for non-emergent surgeries and highlight new practices or workflow patterns.
- Emphasize safety steps/checklists for staff and patient safety during waterborne emergencies.
- Proactively share information about staffing changes, furloughs, and pay reductions.
- Solicit feedback from employees and create avenues for open dialogue.
- Share success stories, progress updates, and moments of pride within the organization.

Tools for Employees

- Establish an online forum with a Q&A function for staff to seek advice, share experiences, and ask questions.
- Develop a resource center with relevant documents, tools, and resources related to waterborne pathogens, emergency preparedness, and SOP/SOG.
- Provide consistent talking points and messages for clinicians to relay to patients, ensuring accurate information sharing.
- Create printable signage for clinician offices with consistent messaging for patient communication.

External Communication Plan: Emergency Preparedness and SOP/SOG Development

1. Objective

The external communication plan aims to effectively communicate the Hospital's efforts in addressing waterborne pathogens and developing an Emergency Preparedness Plan and Standard Operating Procedure/Guideline (SOP/SOG). The plan seeks to demonstrate the organization's commitment to responding to waterborne outbreaks, ensuring patient safety, and positioning them as trusted resources within the community. The communication efforts emphasize the measured steps taken to provide safe and reliable healthcare services.

2. Key Messages:

- **Commitment to Patient Safety:** Highlight the Hospital's dedication to patient safety and their proactive approach in addressing waterborne pathogens and emergency preparedness.

- **Trusted Resource for the Community:** Establish the Hospital as a reliable source of information and expertise on waterborne pathogens, emphasizing their role in providing accurate and timely guidance.
- **Science and Expertise:** Emphasize that the organizations' actions and protocols are grounded in science and guidance from public health/ clinical experts, ensuring the highest standard of care.
- **Collaboration and Unity:** Communicate the coordinated efforts of the Hospital in addressing waterborne pathogens, showcasing the unity and strength of the healthcare system.

3. Communication Strategies:

Spokesperson and Message Coordination:

- Designate a single spokesperson to coordinate talking points and ensure consistent messaging across all communication channels.

Media Relations:

- Develop press releases and media statements to announce the implementation of the Emergency Preparedness Plan and SOP/SOG, highlighting the organizations' commitment to patient safety and readiness.
- Proactively engage with local media outlets to provide accurate information and updates on waterborne pathogens and the organizations' efforts.

Website and Online Presence:

- Update the organizations' websites with dedicated sections on waterborne pathogens, emergency preparedness, and SOP/SOG development.
- Share informative articles, blog posts, and FAQs to educate the public about waterborne risks and the organizations' preventive measures.

Social Media:

- Utilize social media platforms to disseminate key messages, share updates on waterborne pathogens, and highlight the organizations' proactive approach to patient safety.
- Engage with followers, respond to inquiries, and provide accurate information and resources.

Community Engagement:

- Organize virtual town halls or webinars to address community concerns and provide information on waterborne pathogens, emergency preparedness, and SOP/SOG development.
- Collaborate with community organizations, schools, and local authorities to conduct educational outreach programs on waterborne risks and preventive measures.

Patient and Stakeholder Communications:

- Develop consistent messaging for patient communication, ensuring accurate and updated information on waterborne pathogens, safety measures, and available healthcare services.
- Share communication resources/ updates with governing boards, referring physicians, and other stakeholders to maintain collaboration and clarity.

Thought Leadership:

- Position the Hospital as thought leaders in waterborne pathogen prevention by offering expert opinions, participating in relevant conferences or webinars, and contributing to scientific publications.

Crisis Communication:

- Develop a crisis communication plan to address any waterborne-related incidents promptly and transparently, providing accurate information and reassurance to the public.

Consistent Top-Level Messages

- The Hospital protect the community's health while caring for the sick and the injured.
- Hospitals are open and accessible to all patients, and delaying care may pose significant risks to health. Immediate care should be sought in case of a medical emergency.
- Rigorous workflow and infection control processes are in place at the Hospital to ensure the safety of patients and healthcare workers.
- The Hospital diligently follows national, state, and local guidelines, taking measured steps to deliver safe care.

Mass Communications Tactics

- Video messages: Hospital leaders and physicians deliver video messages to the community, sharing updates on waterborne pathogen preparedness and safety measures.
- Virtual town hall meetings: Conduct virtual town hall meetings to address community concerns and provide accurate information.
- Radio interviews and PSAs: Engage in radio interviews and broadcast public service announcements to reach a wider audience and convey key messages.
- Open letters: Publish open letters in local newspapers, emphasizing the Hospital's commitment to patient safety and care.
- Media briefings: Arrange media briefings featuring different experts to provide accurate information and answer questions.

Communications Assessment for Leaders

- Provide accurate information based on science and public health guidance, emphasizing the Hospital's commitment to public safety.
- Be transparent in sharing the current guidance being followed and updates on any new guidance or practices.

- Communicate the importance of not delaying emergency care and highlight the safety protocols in place at the emergency department.
- Share patient success stories to demonstrate safe and effective care delivery.
- Remind patients of existing safety practices and communicate additional steps taken to enhance safety and prevent the spread of waterborne infections.
- Highlight the importance of the Water Management Program by CMS and CDC in controlling Legionella and other waterborne pathogens (10).
- Communicate measures taken to ensure the safety and well-being of healthcare workers, including new guidelines and infection prevention protocols.
- Inform the community about new services, such as screening tools, hotlines for waterborne-related questions, telehealth options, and mental health support resources.

Note: The Hospital will utilize the resources provided by the CDC to enhance their communication efforts. The CDC offers a comprehensive communications guidance toolkit for health departments, which includes setting- and scenario-specific modules. Specifically, the Council for State and Territorial Epidemiologists Legionnaires' Disease Risk Communication Toolkit will be utilized to ensure effective communication strategies and messages tailored to the specific risks associated with Legionnaires' disease

Mutual Aid Agreement

Mutual Aid Agreements are an essential aspect of the Hospital's Emergency Preparedness Plan, which specifically focuses on addressing waterborne pathogens and developing a Standard Operating Procedure/Guideline (SOP/SOG). As per the Integrated Disease Surveillance and Response (IDSR) guidelines, the local emergency proclamation process in follows the established protocols set by the CDC, the State Department of Public Health, and the Waterborne Disease Surveillance and Response agencies.

Mutual Aid Agreements aim to establish a cooperative framework between the Hospital and external organizations to ensure effective assistance during emergencies. The agreements encompass the following key elements:

1. **Identification of Partner Organizations:** The Hospital will identify and establish agreements with relevant organizations, including local healthcare facilities, water authorities, and emergency response agencies such as the CDC and the State Department of Public Health. This collaboration enables coordinated efforts in combating waterborne diseases and responding to emergencies.
2. **Roles and Responsibilities:** Clear roles and responsibilities will be defined for each participating organization. This includes outlining the specific functions and tasks assigned to them during emergency situations. The scope of support and coordination mechanisms will also be established to ensure effective collaboration and streamlined response efforts.
3. **Resource Sharing:** Mutual Aid Agreements outline the types of resources that can be shared among participating organizations. These resources may include personnel,

equipment, expertise, and supplies. Procedures for requesting and providing assistance will be established, ensuring a prompt and coordinated response to emergencies related to waterborne pathogens.

The Hospital participates in several Memorandums of Understanding (MOU) and Memorandums of Agreement (MOA) to strengthen mutual aid and collaboration during emergency situations. These agreements are designed to enhance coordination, resource sharing, and response efforts among various organizations. Some key MOUs and MOAs that the Hospital is part of include:

1. **Local Health Department MOU:** The Hospital has a formal MOU with the local health department, establishing a collaborative relationship and outlining the roles and responsibilities of each party during emergencies. This agreement facilitates effective communication, information sharing, and coordination of response efforts.
2. **Regional Healthcare Coalition MOU:** The Hospital is an active participant in the regional healthcare coalition, which brings together healthcare organizations, emergency management agencies, public health departments, and other key stakeholders. The MOU outlines the mutual aid and support commitments among coalition members, ensuring coordinated response and resource sharing during emergencies.
3. **Water Authority MOU:** The Hospital has established an MOU with the local water authority, recognizing the importance of collaboration in addressing waterborne pathogens. This agreement allows for the exchange of information, joint planning, and coordination of efforts to ensure the safety and quality of the water supply.
4. **Emergency Response Agency MOU:** The Hospital has forged an MOU with local emergency response agencies, such as fire departments, law enforcement, and emergency medical services. This agreement outlines the cooperation and assistance between the hospital and these agencies during emergencies, particularly in responding to incidents related to waterborne pathogens.

These MOUs and MOAs serve as formalized mechanisms for mutual aid and support, enabling the Hospital to leverage resources, expertise, and collaborative relationships in times of crisis. The Hospital enhances its emergency preparedness and response capabilities by actively participating in these agreements, ensuring a comprehensive and coordinated approach to preventing and controlling waterborne pathogens, including Legionella bacteria.

Concept of Operations (CONOPS)

1. Introduction

The purpose of the Concept of Operations (CONOPS) is to outline the response strategy and procedures for addressing waterborne pathogens, with a specific focus on cases of Legionnaires' disease affecting the area. The CONOPS provides a framework for the Hospital to effectively respond to and manage incidents related to Legionnaires' disease, ensuring the safety and well-being of patients, staff, and the community. It serves as a comprehensive Standard Operating Procedure/Guideline (SOP/SOG) that aligns with industry best practices and regulatory guidelines to guide the implementation of preventive and control measures. The CONOPS outlines key elements such as incident detection, reporting, coordination with relevant authorities, risk assessment, mitigation strategies, communication protocols, and ongoing evaluation and improvement processes. By following the CONOPS, the Hospital can establish a consistent and coordinated approach to prevent and control Legionella bacteria, minimize the risk of outbreaks, and enhance overall patient and community safety.

2. Assessing the needs of the affected population

The primary objective of this CONOPS is to detect and identify cases of Legionnaires' disease promptly and accurately. Patients who meet clinical and laboratory criteria for confirmed Legionnaires' disease are further classified based on the duration of healthcare exposure:

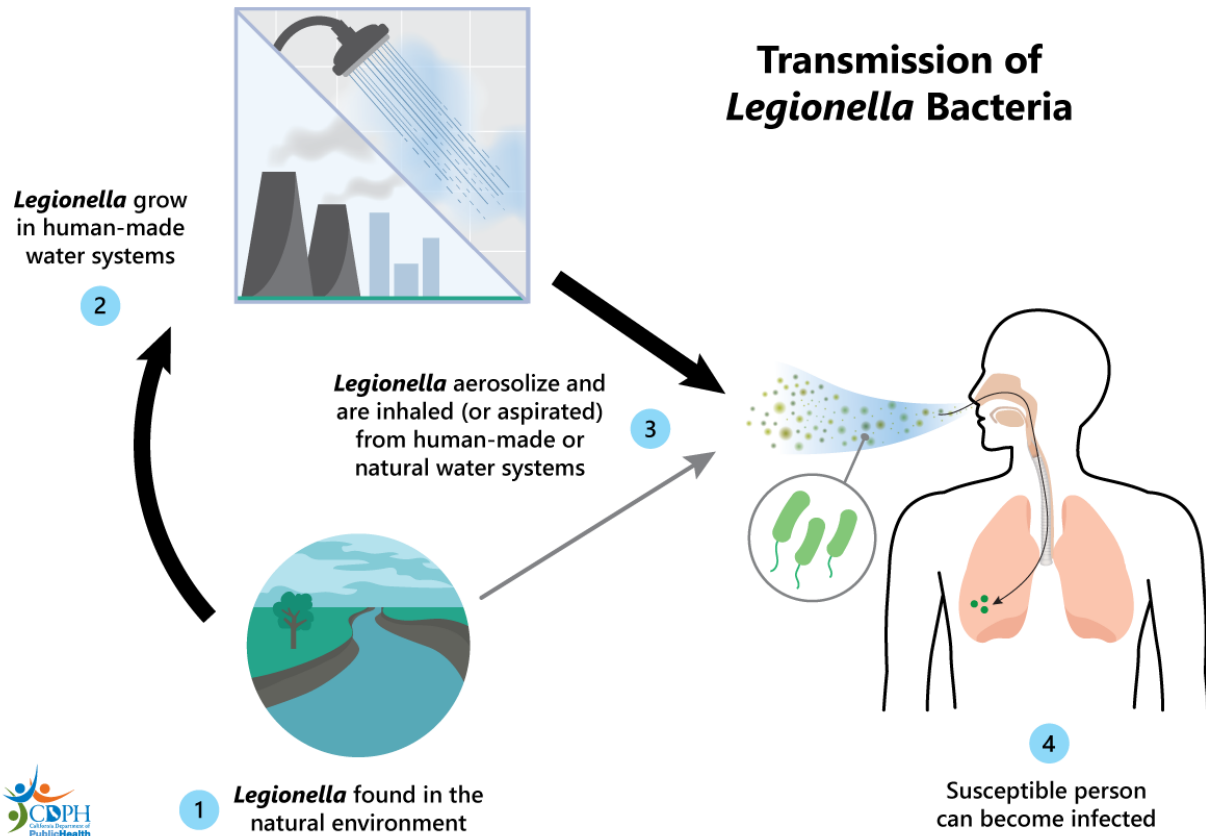
- Presumptive healthcare-associated Legionnaires' disease: A case with ≥ 10 days of continuous stay at a healthcare facility during the 14 days before at the onset of symptoms.
- Possible healthcare-associated Legionnaires' disease: A case that spent a portion of the 14 days before the date of symptom onset in one or more healthcare facilities but does not meet the criteria for presumptive healthcare-associated Legionnaires' disease.

3. Matching available resources

The Center of Disease Control and Prevention (CDC) recommends that public health officials perform a full investigation for the source of Legionella in a facility upon identification of:

- ≥ 1 case of presumptive healthcare-associated Legionnaires' disease at any time
- 22 cases of possible healthcare-associated Legionnaires' disease within 12 months of each other.

Methods of Surveillance



Source: <https://www.cdph.ca.gov/Programs/CID/DCDC/PublishingImages/DIS/LegionellaTransmission.png?v=2.0>

4. Standard Operating Guidelines (SOG) for Legionellosis Reporting

1. Tracking and Reviewing Cases:
 - Public health officials should maintain an internal system for tracking and reviewing legionellosis cases.
 - This system should be utilized to identify epidemiologic links and initiate timely investigations.
2. Reporting to National Notifiable Diseases Surveillance System (NNDSS):
 - All cases of legionellosis should be reported to NNDSS, which requires basic demographic information.
 - Reporting methods to NNDSS may vary by the health department.
 - For more information on reporting cases of legionellosis to NNDSS, refer to the designated resources.
3. Reporting to State Legionellosis Disease Surveillance System (SLDSS):
 - Public health officials should report all cases of legionellosis to SLDSS.
 - SLDSS allows for reporting additional information, including exposure to travel and healthcare facilities and laboratory confirmation data.

- Reporting can be done using the CDC Legionellosis Case Report Form or a state-specific case report form.
4. Timeliness of Reporting:
 - Ideally, all cases should be reported to SLDSS within 30 days of receiving the case report.
 - Travel-associated cases should be reported within 7 days of receiving the case report.
 - Timely reporting is crucial for identifying possible common sources and facilitating prompt interventions.
 5. Travel-Associated Cases:
 - Approximately 10-15% of legionellosis cases are associated with travel.
 - Public health officials should include travel destination(s), including accommodation or facility names and addresses, and travel dates in the report.
 6. Centralized Reporting for Travel-Associated Cases:
 - Centralized reporting is necessary to link travel-associated cases occurring among residents of different states.
 - CDC will notify state health departments where the exposure took place within one business day of receiving the report from the patient's state of residence for out-of-state exposures.

5. Case Reporting Forms:

1. Complete the CDC Case Report Form (CRF) for legionellosis (Appendix 3).
2. Fill out the Connecticut Supplemental Form (Appendix 4).

Clinical and Exposure Information:

1. An EIP staff member will contact the respective personnel for information retrieval:
 - For hospitalized cases: Contact the infection control practitioner.
 - For outpatients: Contact the attending physician.
2. Provide all relevant clinical details and any exposure information documented in the patient's chart.

Patient Interview:

1. Interview the patient (or next of kin) to verify and supplement the information documented in the medical chart.
2. Collect additional details regarding potential exposures.
3. Update the acquired information with the CTEDSS (Connecticut Electronic Disease Surveillance System) case report form.

Legionellosis Data Entry Wizard:

1. Utilize the "Legionellosis Data Entry Wizard" tool, corresponding to the CDC CRF and CT supplemental follow-up forms.
2. Ensure accurate and complete data entry using this resource.

Document Submission:

1. Scan all completed paperwork and attach it to the respective CTEDSS record.
2. This step ensures that all relevant documentation is securely stored and accessible for future reference.

Cases that require further action:

- Overnight Travel
- Any cases reporting overnight travel out of state should be reported to the legionellosis surveillance coordinator.
- An email to the CDC travel legionella coordinator will be promptly sent, including the following information:
 - Patient gender, age, and county of residence
 - Date of diagnosis/test type
 - Date of symptom onset
 - Dates and location of travel
 - Lodging name, room number, water exposures

Healthcare-Associated Case or Cases (Hospital and SNF-associated cases):

The legionellosis surveillance coordinator should be made aware of all possible or presumptive healthcare-associated Legionnaires' disease health care-associated cases. All the case interviews should be reviewed. An email should be drafted and sent to the healthcare facility using the email template for all possible healthcare-associated Legionnaires' diseases, and it should copy the HAI program.

Patients who [meet clinical and laboratory criteria](#) for confirmed Legionnaires' disease are further classified based on the duration of healthcare exposure:

- **Presumptive healthcare-associated Legionnaires' disease:** A case with ≥ 10 days of continuous stay at a healthcare facility during the 14 days before onset of symptoms.
- **Possible healthcare-associated Legionnaires' disease:** A case that spent a portion of the 14 days before the date of symptom onset in one or more healthcare facilities but does not meet the criteria for presumptive healthcare-associated Legionnaires' disease.

CDC recommends that public health officials perform a full investigation for the source of *Legionella* in a facility upon identification of

- ≥ 1 case of presumptive healthcare-associated Legionnaires' disease at any time
- ≥ 2 cases of possible healthcare-associated Legionnaires' disease within 12 months of each other

Recommended Activities for Legionnaires' Disease Control in Healthcare Facilities

1. Consider [Immediate Control Measures](#):
 - Evaluate recommendations for restricting water within the facility or other necessary control measures to minimize the risk of Legionella growth and transmission.
2. Conduct Retrospective Surveillance Review:
 - Perform a thorough review of past patient records to identify any cases of healthcare-associated pneumonia (onset ≥ 48 hours after admission) that could potentially be linked to Legionnaires' disease.
3. Conduct Active Prospective Surveillance:
 - Implement a period of enhanced surveillance where healthcare facility staff proactively and systematically identify patients with healthcare-associated pneumonia.
 - If a suspect Legionnaires' disease case is identified (i.e., patient with pneumonia of unknown origin), collect sputum or other lower respiratory secretions for Legionella culture or perform Legionella urine antigen testing.
4. Review Water Management Program (WMP) and Conduct [Environmental Assessment](#):
 - Review and assess your existing Water Management Program (WMP) to ensure its effectiveness in preventing Legionella contamination.
 - Conduct an environmental assessment using the CDC Environmental Assessment Form to evaluate potential environmental exposures.
5. Develop an [Environmental Sampling Plan](#):
 - Utilize the findings from the environmental assessment to inform the development of an environmental sampling plan.
 - Implement a water sampling plan that includes testing for Legionella bacteria, as well as physical and chemical parameters (temperature, disinfection residual levels, and pH).
 - Select sampling locations based on patient travel paths and key physical plant areas within the facility.
 - Use the [Sample Data Sheet](#) to record environmental samples collected for Legionella culture accurately.
6. Schedule and Analyze Environmental Water Samples:
 - Collect environmental water samples according to the recommended schedule outlined in CDC guidance.
 - Ensure that environmental culture samples are analyzed by a laboratory participating in the CDC Elite program and certified by the CT DPH Environmental Laboratory Certification program. Refer to the [List of Approved Laboratories for Legionella Testing](#).
7. Remediate/Decontaminate Identified Environmental Sources:
 - Take appropriate remediation or decontamination actions upon identifying possible environmental sources of Legionella contamination.
 - Follow [CDC guidance for decontamination procedures](#).

Additional CDC Resources:

- Refer to the [preferred diagnostic testing for legionellosis](#) to ensure an accurate diagnosis.
- Familiarize yourself with the recommended [treatment for Legionnaires' disease](#).
- For more detailed information, visit the CDC website dedicated to healthcare facilities: <https://www.cdc.gov/legionella/wmp/healthcare-facilities/index.html>.

Environmental Testing and Legionella Water Management Program

Environmental testing plays a crucial role in assessing the risk of Legionella bacteria exposure, which can cause illness when inhaled through aerosolized water. It involves analyzing water's physical, chemical, and microbial constituents, including free chlorine residuals, water temperatures, pH levels, and culturing for Legionella bacteria. All Legionella water cultures must be analyzed by a lab certified by both the CDC ELITE program and the CT DPH Environmental Lab Certification program. Refer to the List of [Approved Laboratories for Legionella Testing](#).

Monitoring Water Parameters and Building a Water Management Program

Regularly collecting water parameter data from various indoor locations is recommended to monitor conditions and identify trends over time. Monitoring can include daily checks of water temperatures and chlorine levels manually or through automated building systems. The ability to detect changes early enables prompt corrective actions. Establishing a Legionella water management program involves the following steps:

1. Establish a Water Management Program Team:
 - Form a team with the necessary skills to develop and implement the program, considering training or hiring professionals with expertise in environmental and Legionella management.
2. Describe Building Water Systems:
 - Create flow diagrams and written descriptions of building water systems, including connections to the municipal water supply, water distribution, and equipment locations like hot tubs, water heaters, boilers, and cooling towers.
3. Identify Areas Prone to Legionella Growth:
 - Determine areas within the water systems where conditions could promote Legionella growth or low water flow.
4. Apply Control Measures and Establish Monitoring:
 - Implement control measures to limit Legionella growth, such as heating, disinfection, and cleaning.
 - Define control limits and establish monitoring plans for each hazardous condition, including where and how to monitor.
5. Intervene When Control Limits Are Exceeded:
 - Develop corrective actions or contingency responses for situations when control measures fall outside established limits.
6. Ensure Program Effectiveness:
 - Regularly verify and validate the water management program's implementation and effectiveness throughout the building water systems.
 - Update the program as necessary.

7. Document and Communicate:

- Maintained detailed records of all program activities and regularly communicated with building occupants, employees, and colleagues.
- Review and update the program in response to any triggering events.

Additional Resources:

To aid in the development of the water management program, the CDC provides valuable tools and resources:

- [ANSI/ASHRAE Standard 188-2018: Legionellosis Risk Management for Building Water Systems](#)
- [ASHRAE Guideline 12-2020: Managing the Risk of Legionellosis Associated with Building Water Systems](#)
- [CDC Legionella Environmental Assessment Form](#)
- [CDC Toolkit for Controlling Legionella in Common Sources of Exposure \(Legionella Control Toolkit\)](#)

Water System Maintenance:

a. AIHA Guidance on *Legionella* in Building Water Systems

AIHA (2015) is a guidance document intended to help building managers anticipate, recognize, evaluate, and control *Legionella* in buildings. It covers premise plumbing; cooling towers and evaporative condensers; hot tubs, whirlpools, and spas; decorative fountains and water features; humidifiers; the water supply system; sprinklers, eyewash stations, and safety showers. The guidance differentiates its approach to *Legionella* management (which comes from the industrial hygiene field) from what is labeled “current health practice” that goes into action only after a case of Legionnaires' disease has occurred. The guidance describes such “current health practice” as appropriate for diseases transmitted between persons but ineffective when the environment is the source of the etiologic agent. Hence, AIHA (2015) focuses on identifying sites of *Legionella* amplification and exposure pathways using measurements of viable *Legionella* bacteria; it does not endorse sampling surrogates such as disinfectant residual.

Like other guidance documents, AIHA (2015) is based on risk assessment but tends to be more descriptive. It specifically calls for *Legionella* samples to be collected (to be assayed via the culture method) from selected water systems on an ongoing basis to determine the effectiveness of control strategies and identify potential hazards. AIHA (2015) recommends that, although PCR techniques can be used as a complementary analysis, they should not replace culture-based methods. Table 1, taken from the guidance document, provides levels of *Legionella* that can be considered action levels to compare to routine sampling results. For all water system types (except cooling towers), a measured concentration below 1 CFU/mL (1,000 CFU/L) is considered to be at the detection limit. *Legionella* amplification could be possible between 1 and 10 CFU/mL (1,000 to 10,000 CFU/L). A sample above 10 CFU/mL (10,000 CFU/L) indicates that amplification has occurred, and action needs to be taken (for cooling

towers, the document suggests that 100 to 1,000 CFU/mL [10^5 to 10^6 CFU/L] is indicative of possible amplification). These values mirror those of the Occupational Safety and Health Administration (OSHA), which used to suggest guidelines for *Legionella* to assess the effectiveness of water system maintenance but no longer does.

TABLE 1 AIHA Data Interpretation Guidelines

Sample Source	Non-Detectable	Acceptable Low*	Action	Possible Amplification	Action	Indicates Amplification	Action
Humidifiers & Misters	< CFU/mL	< CFU/mL	1	1-10 CFU/mL	2	>10 CFU/mL	3
Decorative Fountains and Water Features	< CFU/mL	< CFU/mL	1	1-10 CFU/mL	2	>10 CFU/mL	3
Hot Tubs, Whirlpools and Spas	< CFU/mL	< CFU/mL	1	1-10 CFU/mL	2	>10 CFU/mL	3
Potable Water	< CFU/mL	< CFU/mL	1	10-100 CFU/mL	2	>100 CFU/mL	3
Industrial Working Fluids	< CFU/mL	< CFU/mL	1	10-100 CFU/mL	2	>100 CFU/mL	3
Cooling Towers & Evaporative Condensers	< CFU/mL	< CFU/mL	1A	100-1,000 CFU/mL	2A	>1,000 CFU/mL	3A

*May be limited by *Legionella* levels in the building source water supply (e.g., municipal water).

NOTES: Action levels (see AIHA, 2015 for complete details): (1) Continue to monitor as per the plan. (2) If there are no cases of legionellosis, reassess maintenance and treatment plans; make adjustments as necessary. If cases of legionellosis occur, take immediate steps to clean and disinfect the system. Notify appropriate health authorities. (3) Take immediate steps to clean and disinfect the system. Adjust the control plan as needed.

SOURCE: AIHA (2015).

Unlike the other guidance documents, AIHA (2015) discusses the side effects of various treatment techniques that should be considered. The guidance also provides considerable detail about protecting workers and building occupants (such as with point-of-use devices) during remediation activities.

b. NSF Standard 453 for Cooling Towers

NSFI Standard 453 (NSFI, 2017) provides minimum practices for treating, operating, and maintaining cooling towers to avoid *Legionella* growth. The standard uses the terms *program* (all the conducted activities) and *plan* (the program's documentation) and adheres to the bulleted list of risk management elements discussed previously.

Standard 453 requires cooling tower treatment with an oxidizing biocide and maintaining pH, corrosion control, scale and deposit control, and conductivity. Startup procedures for cooling towers are outlined, including initial startup and after a system shut-down. Routine inspection, service, and maintenance are outlined weekly, quarterly, and when an issue occurs. Cycles of concentration are key operating parameters for cooling towers that must be monitored, managed, and documented.

Monitoring of biocides is required as part of standard 453, as is testing for heterotrophic plate counts and *Legionella*. If concentrations of *Legionella* are less than 10 CFU/mL (10,000 CFU/L), no action is needed. If concentrations are between 10 and 100 CFU/mL (10,000-100,000 CFU/L), then the entire program must be reviewed, and online remedial treatment is needed. Between 100 and 1,000 CFU/mL (10^5 to 10^6 CFU/L), a visual inspection is also required (in addition to the above) to determine whether full draining and repair are required. Greater than 1,000 CFU/mL (10^6 CFU/L) requires off-line remedial treatment, and the standard describes the conditions for completely shutting down the cooling tower. This standard will be superseded by NSFI standard 444, which, when released, will cover all building water systems, not just cooling towers.

- **Water Treatment:**
 - a. Consider implementing appropriate water treatment methods, such as using biocides or disinfection systems, to control the growth of *Legionella* bacteria.
 - b. Follow the manufacturer's instructions and recommended dosages for water treatment chemicals.
 - c. Regularly monitor and maintain water treatment systems to ensure their effectiveness.

Environmental Monitoring and Program Validation

Monitoring water quality parameters, such as disinfectant and temperature levels, is essential to minimize conditions promoting *Legionella* and other germs in drinking water systems. Program validation can involve environmental sampling for *Legionella* as part of a comprehensive water management program. The sampling frequency, location, and methodology should be determined based on factors like environmental assessment findings, the performance of the water management program, and available resources.

- **Monitoring and Testing:**
 - d. Establish a routine monitoring program to assess the presence and levels of *Legionella* bacteria in water systems.

- e. Conduct regular water sampling and testing, following standardized methods and guidelines.
- f. Use validated laboratory facilities to analyze water samples for Legionella bacteria.
- g. Document and maintain records of all monitoring and testing activities, including test results and any corrective actions taken.
- h. Coordinate response efforts with key stakeholders such as county health partners, state health agencies, water authorities, and emergency response organizations.
- i. Ensure timely and effective communication with key stakeholders and the community regarding disease outbreak incidents, response actions, and preventive measures.
- j. Continuously evaluate and improve the response strategy based on lessons learned and emerging best practices.

6. Risk Assessment and Mitigation (Refer to Comprehensive Threat and Hazards Assessment Table: CDC Guidelines)

- Conduct a comprehensive risk assessment to identify potential sources of Legionella bacteria and evaluate the vulnerability of the hospital and its surrounding areas.
- Develop and implement robust mitigation measures, including routine water management practices, disinfection protocols, and environmental monitoring.
- Establish a surveillance system to monitor and track cases of Legionnaires' disease within the hospital and the community, enabling early detection and response.

7. Response Procedures

- Activate the Incident Management Team (IMT) to coordinate the response efforts (Appendix 1). The IMT will consist of representatives from relevant departments, including infection control, facilities management, clinical services, and communications.
- Implement a rapid response protocol to investigate suspected cases of Legionnaires' disease, including clinical evaluation, laboratory testing, and environmental assessments.
- Collaborate with local health authorities and water authorities to investigate potential sources of Legionella contamination and implement necessary remediation measures.
- The CDC recommends that healthcare facilities and other businesses that use water systems take the following steps to control Legionella and reduce the risk of Legionnaires' disease:
 1. Regularly maintain all cooling towers, hot tubs, Faucets, and similar systems.
 2. Disinfect all water systems and equipment.
 3. Monitor water temperature and chemical levels.
 4. Regularly test water samples for Legionella.
 5. Install and maintain appropriate filters and strainers.
 6. Use chlorine dioxide or other EPA-registered biocides to control microbial growth.

7. Educate staff and customers on proper maintenance and use of water systems.
 8. Implement a Legionella response plan.
- Ensure the availability of appropriate medical interventions, including diagnostic tests, treatments, and supportive care for affected individuals.
 - Maintain clear lines of communication with stakeholders, providing timely updates on the situation, preventive measures, and any necessary precautions.

8. Training and Preparedness(Preparedness (Refer to the training plan)

- Conduct regular training sessions for staff members involved in the response, emphasizing recognizing, reporting, and appropriate management of Legionnaires' disease cases.
- Develop and regularly update the Standard Operating Procedure/Guideline (SOP/SOG) for addressing Legionnaires' disease, ensuring alignment with CDC guidelines and best practices.
- Conduct drills and exercises to test the effectiveness of the response plan, identify areas for improvement, and enhance the overall preparedness of the hospital and its staff.

9. Evaluating the effectiveness of the disaster response

- Conduct post-incident evaluations to assess the effectiveness of response actions and identify opportunities for improvement.
- Incorporate lessons learned into future response planning and training activities, ensuring continuous enhancement of the response capabilities.

Appendix 1: Incident Management Team (IMT)

Activation Level	Definition/ Parameters	Authority to Activate	Anticipated HICS Activation	Notifications
<p>1</p> <p>Alert/ Notification</p>	<p>Information received indicating a situation or event that will have an actual or potential unusual impact on facility operations.</p> <p><i>Examples:</i></p> <ul style="list-style-type: none"> • National Weather Service issuance of a blizzard/hurricane/tornado watch or warning • Notification from EMS system of a multiple casualty incident (MCI) that may generate patients to the facility • Activation of internal fire alarm (fire not confirmed) • Emergency Department (ED) exceeding bed saturation level (admitted patients holding) 	<p>Administrator on Duty (Business Hours) / Nursing Supervisor (all other times)</p> <p><i>Note: Activation can occur at any level and does not require a stepwise sequence of activation. All activities and notifications consistent with lower levels shall be implemented concurrently</i></p>	<p>Incident Commander Command and General Staff as needed Individual resources as needed</p>	<p>Administrator on Call Emergency Department Charge Nurse Emergency Management Coordinator Environmental Services Supervisor Facilities Engineering Supervisor Health System or Network EOC Nursing Office Safety Officer Security Supervisor Telecommunications Other departments/units/managers as conditions warrant Local government/public safety/ public health / EOC (if services, support, or information needed)</p>
<p>Casualty Care Group Activation/ Response</p>	<p>An immediate or imminent situation arising in the Emergency Department meets EMP activation criteria.</p> <p><i>Examples:</i></p> <ul style="list-style-type: none"> • Unexpected arrival of multiple casualties or contaminated casualties • Incident notification received in the ED from a public safety source indicating the impending arrival (within 15 minutes) of 	<p>ED Charge Nurse (Casualty Care Group Supervisor)</p>	<p>Casualty Care Group Supervisor Triage Unit Leader Immediate Treatment Unit Leader Delayed Treatment Unit Leader Minor Treatment Unit Leader</p>	<p>Incident Commander–designee: Administrator on Duty (Business Hours) / Nursing Supervisor (all other times)</p>

	multiple patients from an incident <ul style="list-style-type: none"> • Outbreak of a disturbance, fire, or unusual situation in the ED 			
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Activation Level	Definition/Parameters	Authority to Activate	Anticipated HICS Activation	Notifications	
2 Minor Impact	An actual situation or event that is having a minor unusual impact on facility operations.	Incident Commander	Incident Commander Operations Section Chief Command Staff as needed Liaison Officer Safety Officer Public Information Officer Branches / divisions / groups / units / individual resources as needed	Administrator on Call Emergency Department Charge Nurse Emergency Management Coordinator Environmental Services Supervisor Facilities Engineering Supervisor Health System or Network EOC Nursing Office Safety Officer Security Supervisor Telecommunications Other departments/ units/managers as conditions warrant Local government/ public safety/ public health / EOC (if services, support, or information needed)	
	Emergency Department and Clinical Factors				
	Patients from single event				10 actual patients, or 3 major trauma patients
	ED waiting time				Greater than 4 hours
	Increase in ED patient census				Greater than 50 percent above normal over 8 hours
	Increase in in-patient census (surge)				1-10 patients admitted above licensed bed count
	Logistical Factors				
	Facilities				Physical plant or utility disruption that is limited, contained, and/or has a minor impact on operations (e.g., a partial system failure; failure of a non-mission-critical system)
	Staff				15 percent of staff not available for duty
Supplies/Materiel	Actual or projected supply shortage of non-critical items, or 48 hours supply remaining of critical items				

	Internal occupancy	Need for horizontal evacuation of patients/visitors/staff from an area of a building			
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Activation Level	Definition/ Parameters		Authority to Activate	Anticipated HICS Activation	Notifications
3 Moderate Impact	An actual situation or event that is having a moderate unusual impact on facility operations.		Incident Commander	Incident Commander Operations Section Chief Logistics Section Chief Command Staff Liaison Officer Safety Officer Public Information Officer Medical / Technical Specialists as needed Planning Section Chief as needed Finance/ Administration Section Chief as needed Branches / divisions / groups / units / individual resources as needed	Administrator on Call Emergency Department Charge Nurse Emergency Management Coordinator Environmental Services Supervisor Facilities Engineering Supervisor Health System or Network EOC Nursing Office Safety Officer Security Supervisor Telecommunications Other departments/ units/managers as conditions warrant Local government/ public safety/ public health / EOC (if services, support, or information needed)
	Emergency Department and Clinical Factors				
	Patients from single event	20 actual patients, or 5 major trauma patients			
	ED waiting time	Greater than 8 hours			
	Increase in ED patient census	Greater than 100 percent above normal over 8 hours			
	Increase in in-patient census (surge)	11-30 patients admitted above licensed bed count			
	Logistical Factors				
	Facilities	Physical plant or utility disruption affecting a major or mission-critical area or system, or affecting general operations			
	Staff	25 percent of staff not available for duty			
	Supplies/ Materiel	Actual or projected supply shortage of critical items, or 24 hours supply remaining of critical items			
	Internal occupancy	Need for vertical evacuation of patients/visitors/staff from one floor of a building			
Event duration	Level 2 event lasting greater than 8 hours				


Activation Level	Definition/ Parameters	Authority to Activate	Anticipated HICS Activation	Notifications	
4 Major Impact	An actual situation or event that is having a major unusual impact on facility operations.		Incident Commander, in consultation with hospital CEO	Incident Commander Operations Section Chief Logistics Section Chief Planning Section Chief Finance/ Administration Section Chief Command Staff Liaison Officer Safety Officer Public Information Officer Medical / Technical Specialists as needed Branches / divisions / groups / units / individual resources as needed	Administrator on Call Emergency Department Charge Nurse Emergency Management Coordinator Environmental Services Supervisor Facilities Engineering Supervisor Health System or Network EOC Nursing Office Safety Officer Security Supervisor Telecommunications Other departments/ units/managers as conditions warrant Local government/ public safety/ public health / EOC (if services, support, or information needed)
	Emergency Department and Clinical Factors				
	Patients from single event	50 actual patients			
	ED waiting time	Greater than 12 hours			
	Increase in ED patient census	Greater than 200 percent above normal over 8 hours			
	Increase in in-patient census (surge)	31-50 patients admitted above licensed bed count			
	Logistical Factors				
	Facilities	Physical plant or utility disruption affecting multiple areas or systems			
	Staff	40 percent of staff not available for duty			
	Supplies/ Materiel	Critical shortage of essential items			
	Internal occupancy	Complete evacuation of a patient care building			
Event duration	Level 3 event lasting greater than 24 hours				

Appendix 2: Emergency Codes

Appendix 3 : Case Report Form

- LEGIONELLOSIS CASE REPORT -


Patient's Name: _____ (S.M., F.M., M.) _____ (Hospital No.) _____ Hospital: _____
 Address: _____ (Street, Apt. No., City, State) _____ (Zip Code) Patient Chart No.: _____
Patient identifier information is not transmittable to CDC



DEPARTMENT OF HEALTH & HUMAN SERVICES
Centers for Disease Control and Prevention (CDC)
Atlanta, Georgia 30333

LEGIONELLOSIS CASE REPORT

(DISEASE CAUSED BY ANY LEGIONELLA SPECIES)



Form Approved OMB No. 0920-0003

- PATIENT INFORMATION -					
1. State Health Dept. Case No. _____	2. Reporting State: _____	3. (CDC Use Only) Case No. _____	4. County of Residence _____	5. State of Residence _____	6. Occupation: _____
7a. Date of Birth: _____ <small>Mo. Day Year</small>	7b. Age: _____ <small>1. Days 2. Mos. 3. Years</small>	8. Sex: _____ <small>1. Male 2. Female</small>	9. Ethnicity: _____ <small>1. Hispanic/Latino 2. Not Hispanic/Latino</small>	10. Race: _____ <small>1. American Indian/Alaskan Native 2. Asian</small>	<small>3. Black or African American 4. Native Hawaiian or Other Pacific Islander 5. White 6. Unk</small>
11. Possible source of exposure: IN THE TWO WEEKS BEFORE ONSET, DID PATIENT:					
a) Travel or stay overnight somewhere other than usual residence? YES _____ NO _____ UNK _____ <small>If Yes, give cities and lodging where available:</small> _____					
*For suspected travel related cases, please contact CDC or pertinent state health departments immediately					
b) Have dental work? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk <small>If Yes, name of dental office: _____</small>					
c) Visit a hospital as an outpatient? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk <small>If Yes, name of hospital: _____</small>					
d) Work in a hospital? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk <small>If Yes, name of hospital: _____</small>					
12. Was case hospital related (nosocomial)?					
<input type="checkbox"/> Not nosocomial: No inpatient or outpatient hospital visits in the 10 days prior to onset of symptoms. <input type="checkbox"/> Possibly nosocomial: Patient hospitalized 2-9 days before onset of legionella infection. <input type="checkbox"/> Unk					
<input type="checkbox"/> Definitely nosocomial: Patient hospitalized continuously for a 10 days before onset of legionella infection. <input type="checkbox"/> Other (Specify): _____					
13. Was this patient's legionella infection: (check one)					
<input type="checkbox"/> Associated with outbreak (Specify location): _____ <input type="checkbox"/> Sporadic case <input type="checkbox"/> Unk					
- CLINICAL ILLNESS -					
14. Diagnosis: (check one)					
<input type="checkbox"/> Legionnaires' Disease (Pneumonia, X-ray diagnosed) <input type="checkbox"/> Other (Specify): _____ <input type="checkbox"/> Pontiac fever (fever, myalgia without pneumonia) <input type="checkbox"/> Unk					
15. Date of symptom onset of Legionellosis Mo. Day Year ____		16. Was patient hospitalized for Legionellosis? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk Hospital name: _____ Hospital address: _____		17. Outcome of illness: <input type="checkbox"/> Survived <input type="checkbox"/> Unk <input type="checkbox"/> Died	
- CASE DEFINITION -					
Confirmed case has a compatible clinical history and meets at least one of the following criteria: <ol style="list-style-type: none"> 1) Isolation of <i>Legionella</i> species from lung tissue, respiratory secretions, pleural fluid, blood or other sterile site 2) demonstration of <i>L. pneumophila</i>, serogroup 1, in lung tissue, respiratory secretions, or pleural fluid by direct fluorescent antibody testing 3) fourfold or greater rise in immunofluorescent antibody titer to <i>L. pneumophila</i>, serogroup 1, to 128 or greater 4) detection of <i>L. pneumophila</i> serogroup 1 antigen in urine 					
Public reporting burden of this collection of information is estimated to average 20 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to CDC, Project Clearance Officer, 1600 Clifton Road, NE D-74, Atlanta, GA 30333, ATTN: PFA (0650-0009). Do not send the completed form to this address. Write your response in permanent blue or black ink.					

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Appendix 4: Legionellosis Case Report

**LEGIONELLOSIS CASE REPORT
CONNECTICUT SUPPLEMENTAL FOLLOW-UP**

Patient Name: _____ ID: _____

1. Occupation:

Is the patient employed? (include volunteer work)

- Yes
- No (if no, skip to *Hospitalization Information*)
- Unknown

Occupation: _____

Name of Company: _____

City: _____ State: _____

2. Hospitalization Information:

Date of Admission: _____ Date of Discharge: _____ Admission diagnosis: _____

3. In the 10 days prior to onset was the patient admitted to a hospital?

- Yes
- No (if no, skip to *Skilled nursing*)
- Unknown

Date of Admission: _____ Date of Discharge: _____ Admission diagnosis: _____

Hospital Name/room number: _____

Was the patient able to leave their hospital room?

- Yes (Ambulatory)
- No (Bedbound)
- Unknown

Did the patient have a roommate?

- Yes
- No
- Unknown

If yes, have they been ill?

- Yes
- No
- Unknown

Did the patient have a bathroom and shower in their room?

- Bathroom and shower
- Bathroom, no shower
- Neither

Did the patient take showers?

- Yes
- No
- Unknown

Annex 1: Threat and Hazard Identification and Assessment

Natural	Technological	Human-caused
Resulting from acts of nature	Involves accidents or the failures of systems and structures	Caused by the intentional actions of an adversary
<ol style="list-style-type: none"> 1. <u>Flooding</u>: Heavy rainfall, storms, or natural disasters can lead to flooding, which can contaminate water sources and infrastructure. This can lead to the spread of waterborne diseases such as cholera, typhoid fever, and diarrhea. 2. <u>Hurricanes and Severe Weather</u>: Strong winds, heavy rainfall, and storm surges associated with hurricanes and severe weather events can damage water treatment facilities, disrupt water supply, and cause water contamination. 3. <u>Groundwater Contamination</u>: Natural processes such as geological activities or infiltration of contaminants from surrounding areas can lead to groundwater contamination, affecting hospital water sources. 4. <u>Drought</u>: Prolonged periods of drought can result in water scarcity and increased stress on 	<ol style="list-style-type: none"> 1. <u>Contaminated water supply</u>: If the hospital's water source becomes contaminated, it can pose a significant risk of waterborne diseases. This can occur due to issues such as equipment failures, cross-connections between potable and non-potable water systems, or contamination from external sources. 2. <u>Failure of water treatment systems</u>: If the hospital's water treatment systems fail or are not properly maintained, it can result in inadequate disinfection of water, allowing waterborne pathogens to persist and pose a risk to patients and staff. 3. <u>Malfunctioning plumbing or sewage systems</u>: Issues with plumbing or sewage systems, such as leaks, blockages, or backflows, can contribute to spreading waterborne diseases within the hospital premises. 4. <u>Inadequate HVAC systems</u>: Heating, ventilation, and air conditioning (HVAC) 	<p>Intentional:</p> <ol style="list-style-type: none"> 1. <u>Sabotage or intentional contamination</u>: Deliberate acts of sabotage or intentional contamination of water supplies pose a significant threat. Adversaries may introduce harmful substances, chemicals, or pathogens into the hospital's water system, potentially spreading waterborne diseases. 2. <u>Cyberattacks</u>: Hospitals rely on computer systems and networks to monitor and control their water treatment and distribution systems. A cyberattack targeting these systems can disrupt operations, compromise the integrity of water quality monitoring, and potentially allow unauthorized access to critical infrastructure. 3. <u>Terrorism</u>: Acts of terrorism, including attacks targeting hospitals, can involve the deliberate contamination of water sources. Adversaries may aim to cause widespread harm by introducing

Natural	Technological	Human-caused
<p>water systems, potentially leading to compromised water quality and the risk of waterborne diseases.</p> <p>5. <u>Algal Blooms</u>: Natural occurrences of algal blooms, such as blue-green algae, in water bodies can produce toxins that contaminate water supplies, posing health risks to individuals exposed to the contaminated water.</p> <p>6. <u>Seasonal Changes</u>: Seasonal variations, such as heavy rainfall or snowmelt, can affect water quality and contribute to the introduction of pathogens, increasing the risk of waterborne diseases.</p> <p>7. <u>Groundwater Table Fluctuations</u>: Changes in the groundwater table due to natural processes or land-use activities can impact the quality and availability of water resources, potentially affecting waterborne disease prevention efforts.</p> <p>8. <u>Eutrophication</u>, an overabundance of nutrients, can result from runoff contaminated with</p>	<p>systems play a crucial role in maintaining indoor air quality. If these systems are not functioning correctly or are not properly maintained, they can contribute to the circulation of airborne pathogens, including those related to waterborne diseases.</p> <p>5. <u>Ineffective medical device reprocessing</u>: Failure to properly clean, disinfect, or sterilize medical devices and equipment that come into contact with water can contribute to the transmission of waterborne pathogens to patients.</p> <p>6. <u>Improper maintenance of water storage and distribution systems</u>: Inadequate cleaning and maintenance of water storage tanks, distribution pipes, and fixtures can lead to biofilm formation, bacterial growth, or other contamination issues, posing risks to patients and staff.</p> <p>7. <u>Power failures</u>: Electrical power outages can disrupt critical systems, including water treatment and disinfection processes, compromising the hospital's ability to provide safe water and prevent waterborne diseases.</p>	<p>waterborne pathogens or toxic substances into the hospital's water supply.</p> <p>4. <u>Unauthorized access</u>: Unauthorized individuals gaining access to water infrastructure or facilities can tamper with the system, compromising the quality of water and increasing the risk of waterborne diseases. This can include tampering with water treatment equipment, bypassing safety measures, or introducing contaminants.</p> <p>Non-Intentional:</p> <p>1. <u>Human error</u>: Accidental mistakes or negligence by staff members responsible for maintaining water systems can lead to waterborne disease hazards. Errors in disinfection procedures, equipment maintenance, or monitoring can compromise water quality and create opportunities for the proliferation of pathogens.</p> <p>2. <u>Lack of proper training and awareness</u>: Insufficient training or awareness among staff members regarding waterborne disease prevention protocols can increase the risk of</p>

Natural	Technological	Human-caused
<p>fertilizers and pesticides and disrupt natural ecosystems.</p> <p>9. <u>pH fluctuation</u> It is typically caused by natural processes and environmental factors such as weathering of rocks, or changes in the chemical composition of water sources. pH levels can naturally vary in bodies of water due to factors like rainfall, runoff, and biological processes. certain human activities, such as industrial pollution or improper disposal of chemicals, can also contribute to pH fluctuations in water sources, making it a potential human-caused hazard as well. Therefore, pH fluctuation can fall into both the natural and human-caused hazard categories, depending on the specific circumstances and contributing factors.</p> <p>10. <u>Parasitic Contamination</u> Presence of waterborne parasites, such as Cryptosporidium or Giardia, in water sources</p> <p>11. <u>Bacterial Contamination</u> Presence of pathogenic</p>	<p>8. <u>Equipment sterilization failures:</u> Hospital equipment that comes into contact with water, such as endoscopes, surgical instruments, or hemodialysis machines, must be properly sterilized to prevent the transmission of waterborne pathogens. Malfunctioning sterilization equipment or inadequate cleaning protocols can lead to the persistence of pathogens and increase the risk of infections.</p> <p>9. <u>information technology (IT) system vulnerabilities:</u> Hospitals use IT systems for various functions, including managing patient records, communication, and monitoring equipment. IT system vulnerabilities, such as cyberattacks or data breaches, can potentially disrupt operations, compromise patient data, and impact waterborne disease prevention protocols.</p> <p>10. <u>City water contamination</u> - potential Fairfield County's Groundwater basin contamination with toxic manufacturing substances.</p> <p>11. <u>Backflow and Cross-Connection:</u> Cross-connections or backflow incidents allowing the entry of contaminants, including</p>	<p>contamination. Without proper knowledge and understanding, employees may unintentionally contribute to the spread of waterborne pathogens.</p> <p>3. <u>Supply chain issues:</u> Human-caused disruptions in the supply chain, such as intentional contamination of water treatment chemicals or equipment, can compromise the effectiveness of water treatment processes and increase the risk of waterborne diseases.</p> <p>4. <u>Nosocomial Outbreaks:</u> In hospitals, where patients often share close quarters, inadequate hygiene practices can contribute to nosocomial outbreaks. These outbreaks can involve infectious diseases such as norovirus, Clostridium difficile (C. difficile), or methicillin-resistant Staphylococcus aureus (MRSA). Poor hand hygiene, improper disinfection of surfaces, or insufficient sterilization of medical equipment can all contribute to the spread of these pathogens among patients, staff, and visitors.</p> <p>5. <u>Inadequate wastewater treatment:</u> This can lead to higher infection rates</p>

Natural	Technological	Human-caused
<p>bacteria, such as Legionella, E. coli, Salmonella, in water sources that can create Waterborne diseases, including respiratory and GI illnesses.</p> <p>12. <u>Parasitic Contamination</u> Presence of waterborne parasites, such as Cryptosporidium or Giardia, in water sources</p> <p>13. <u>Tetanus</u>: primarily associated with natural hazardous events and is caused by the bacterium Clostridium tetani. It commonly enters the body through contaminated wounds, especially when proper wound care and vaccination coverage levels are low. Natural hazardous events such as injuries caused by cuts, puncture wounds, or animal bites increase the risk of tetanus infection.</p> <p>14. <u>Evacuation Challenges</u>: During emergencies like floods or wildfires, hospitals may need to evacuate patients and personnel swiftly. The evacuation process can be complicated by waterborne pathogens, as it requires the careful</p>	<p>Legionella, into the water supply.</p> <p>12. <u>Infrastructure Disruptions</u> caused by construction, repairs, or accidents leading to water supply interruptions or contamination of water with pathogens, including Legionella.</p> <p>13. <u>Chemical Spills or Leaks</u>: Accidental spills or leaks of chemicals used in water treatment, disinfection, or cleaning processes can pose chemical hazards. These incidents can result in exposure risks for patients, staff, or maintenance personnel, and can also contribute to water contamination and the spread of waterborne pathogens.</p> <p>14. <u>Inadequate Personal Protective Equipment (PPE)</u>: Failure to provide or use appropriate personal protective equipment (PPE) when handling chemicals or performing tasks related to water treatment or plumbing systems can increase the risk of chemical hazards. This includes exposure to corrosive substances, toxic fumes, or irritants that can impact the health and</p>	<p>among patients, particularly those who are immunocompromised or undergoing surgical procedures. Also, Inadequate treatment can result in non-compliance with regulatory requirements, potentially leading to penalties, legal issues, and damage to the hospital's reputation.</p> <p>6. <u>Heavy Metals</u>: Heavy metals, such as lead, mercury, and arsenic, can contaminate water sources through human activities such as industrial discharge, improper waste disposal, or corrosion of plumbing systems.</p> <p>7. <u>Pharmaceuticals</u>: The presence of pharmaceuticals in water sources is primarily caused by human activities, including the disposal of unused medications, improper wastewater treatment, and the excretion of pharmaceutical compounds by individuals.</p> <p>8. <u>Agricultural runoff containing fecal matter</u>: it may affect the ability to provide safe drinking water to patients and staff, potentially leading to the spread of waterborne diseases. Contaminated</p>

Natural	Technological	Human-caused
<p>management and transport of patients, particularly those with compromised immune systems or contagious diseases.</p> <p>15. <u>Temperature Extremes:</u> Extreme heatwaves or cold spells can impact the temperature control of water systems in hospitals. Elevated water temperatures can facilitate the growth and proliferation of certain waterborne pathogens, while freezing temperatures can cause pipes to burst, leading to water leaks and contamination risks</p>	<p>safety of individuals in the hospital environment.</p> <p>15. <u>Structural Failures:</u> Failure or collapse of structures within the hospital premises can pose significant physical hazards. This includes issues such as roof leaks, wall failures, or ceiling collapses, which can lead to injuries and potentially contribute to the spread of waterborne pathogens.</p> <p>16. <u>Improper Ergonomic Design of Workstations:</u> Inadequate ergonomic design of workstations, such as those related to water treatment or plumbing systems, can lead to ergonomic hazards. This includes issues such as poor workstation layout, improper positioning of equipment or controls, or lack of ergonomic support, which can contribute to musculoskeletal disorders and workplace injuries.</p>	<p>water can also hinder the proper cleaning and disinfection of medical equipment and surfaces, increasing the risk of healthcare-associated infections.</p> <p>9. <u>Discharge of untreated sewage:</u> Untreated sewage can introduce a range of pathogens, chemicals, and pollutants into water sources. This contamination can directly affect the hospital's water supply, posing a risk of waterborne diseases and compromising the safety of patients and staff.</p>

Annex 2: A Training on Legionella Water Management Programs

W258 Annex 2 Training Seminar

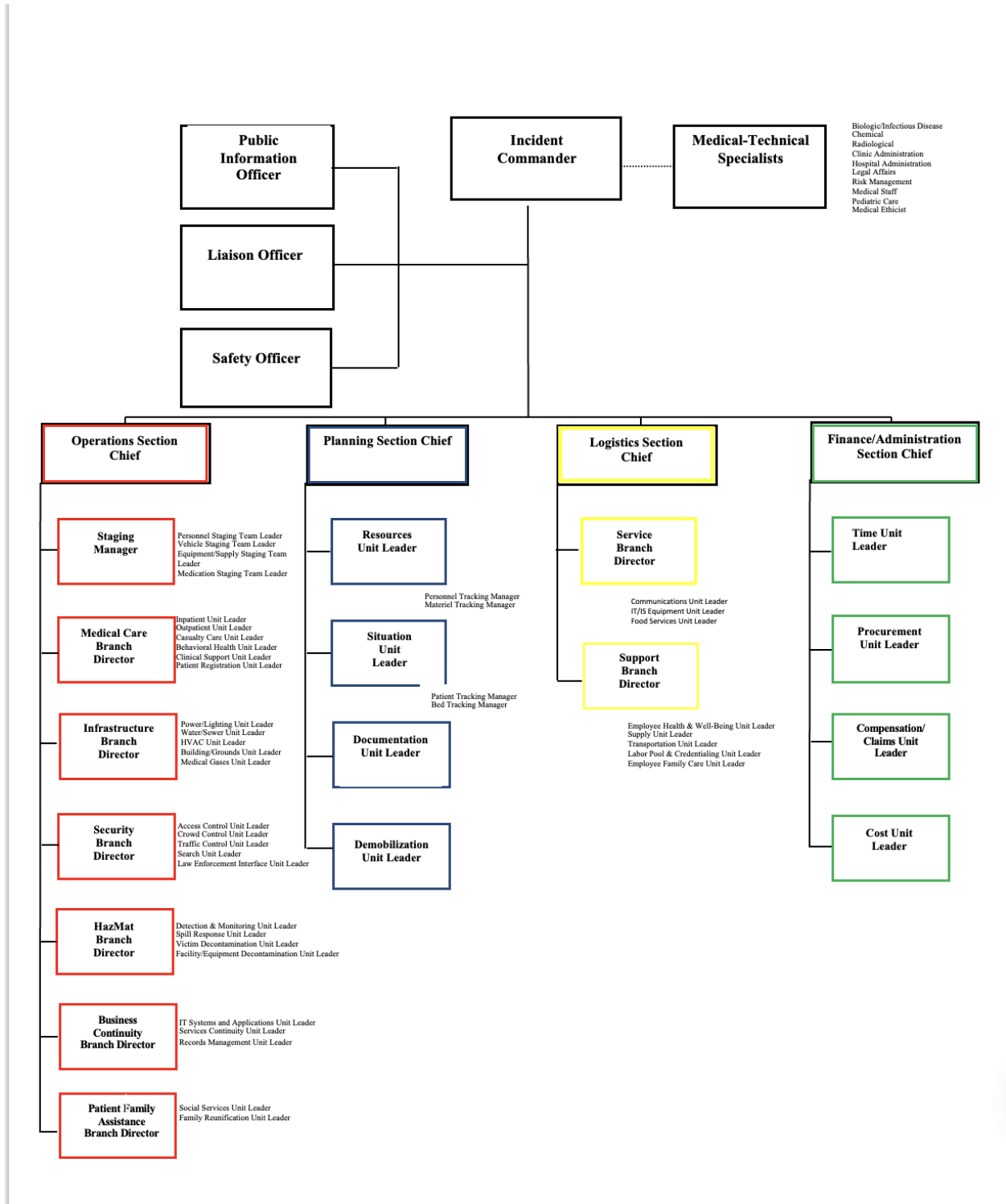
Training Seminar Title: A Training on Legionella Water Management Programs	
Objectives of your Training Seminar (What mitigation strategy are you advocating?)	Preventing Legionnaires' Disease: A Training on Legionella Water Management Programs (PreventLD Training)
Estimate Length of Training	3 hrs
Target Audience and max size of audience.	Hospital staff and public health professionals
Who would be a good candidate (e.g., structural engineer, health dept. official, first responder?) as Facilitator of this session? Why?	Structural engineer, emergency preparedness management staff, building managers, and safety officers. These staff are subject matter experts and/or are qualified to administer the training.

<p>What do you want community members to do as a result of their attending this session?</p>	<ol style="list-style-type: none"> 1. Create an account/ login to <u>Western Region Public Health Training Center at the University of Arizona External external icon</u>. 2. Reduce risk for <i>Legionella</i> in facilities through water management programs. 3. Help hospital water management programs align with ASHRAE 188 on reducing risk for <i>Legionella</i> in building water systems (e.g., potable water, cooling towers, hot tubs, etc.). 4. Build common language across the range of professionals involved in water management programs. 5. Expand education by analyzing case studies, templates, and other practical resources to reduce the risk for <i>Legionella</i> and protect those at increased risk of Legionnaires' disease: adults aged 50 years or older, current or former smokers, and those with a weakened immune system or chronic disease.
<p>Strategies to increase community uptake of your mitigation (We have lots of useful links for checklists on the Course Home page under the Important Links page.)</p>	<ol style="list-style-type: none"> 1. Hand out educational material about <i>Legionella</i> biology, epidemiology, and safety. 2. Show pictures of how to identify areas where <i>Legionella</i> could grow and spread. 3. Give out coupons for disinfection technologies installation. 4. Give out ready to complete emergency contact lists, have them complete while in session.

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Annex 3: Hospital Incident Command Chart



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