Investigating Healthcare-Associated Legionnaires' Disease

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California Department of PublicHealth

CDPH HAI Program Outbreak Team

Legionnaires' disease expertise:

- Medical Officers:
  - Janice Kim, MD, MPH
  - Jon Rosenberg, MD
  - Erin Epson, MD
- Epidemiologists:
  - Kyle Rizzo, MPH
  - Sean O'Malley, MPH

Objectives:

I. Describe roles and responsibilities during HAI investigations:
   a. Local health departments (LHD)
   b. CDPH Healthcare-Associated Infections (HAI) Program
   c. Licensing and Certification (L&C) District Offices

Objectives:

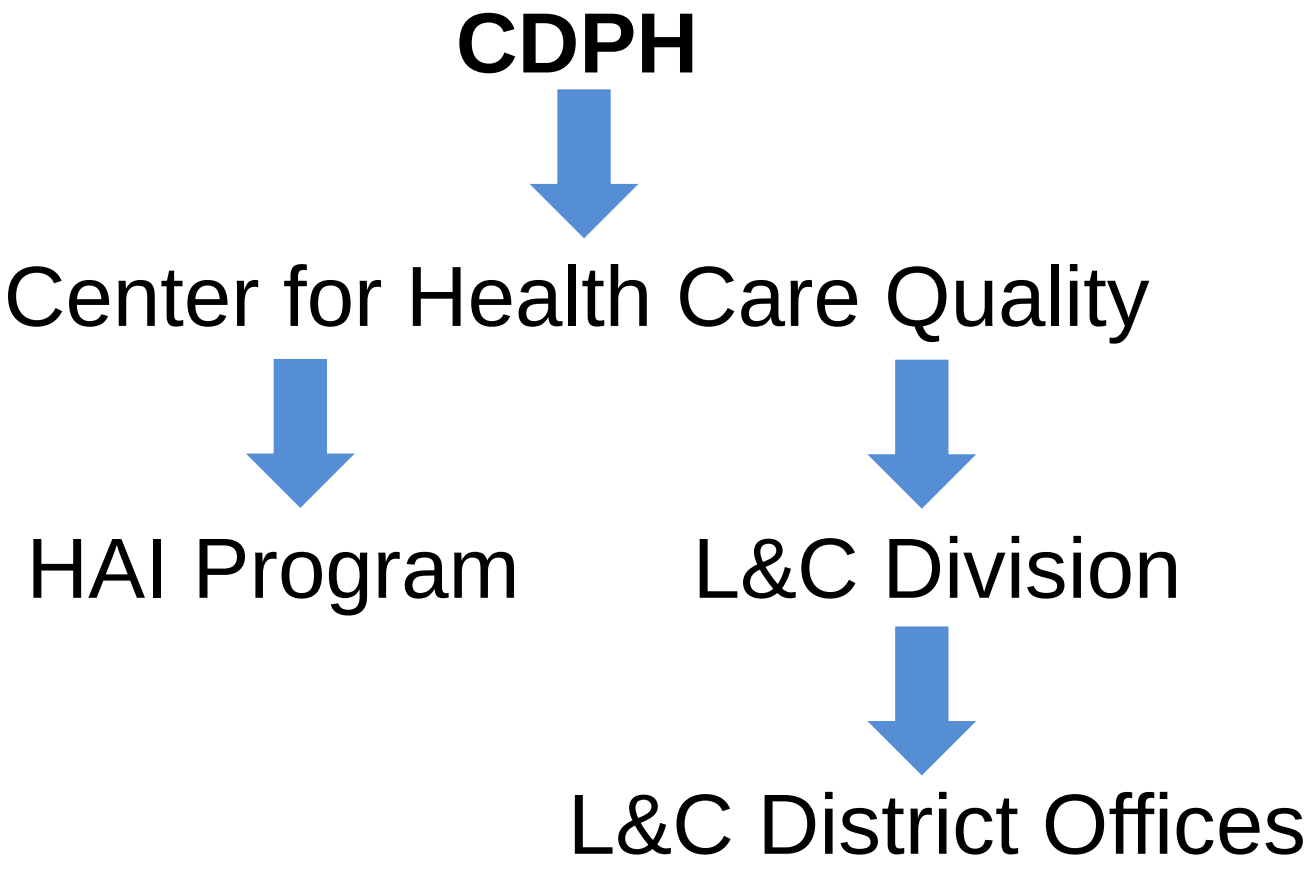
II. Review Legionnaires' disease epidemiology

III. Understand steps for investigating healthcare-associated Legionnaires' disease

IV. Highlight lessons learned from a local health department's outreach strategy

I. Roles and Responsibilities During HAI Investigations

Roles and Responsibilities



Roles and Responsibilities

HAI Program:

- Oversee prevention, surveillance, and reporting of HAI in California's general acute care hospitals
- CDPH healthcare epidemiology and infection control subject matter experts

Roles and Responsibilities

L&C District Offices:

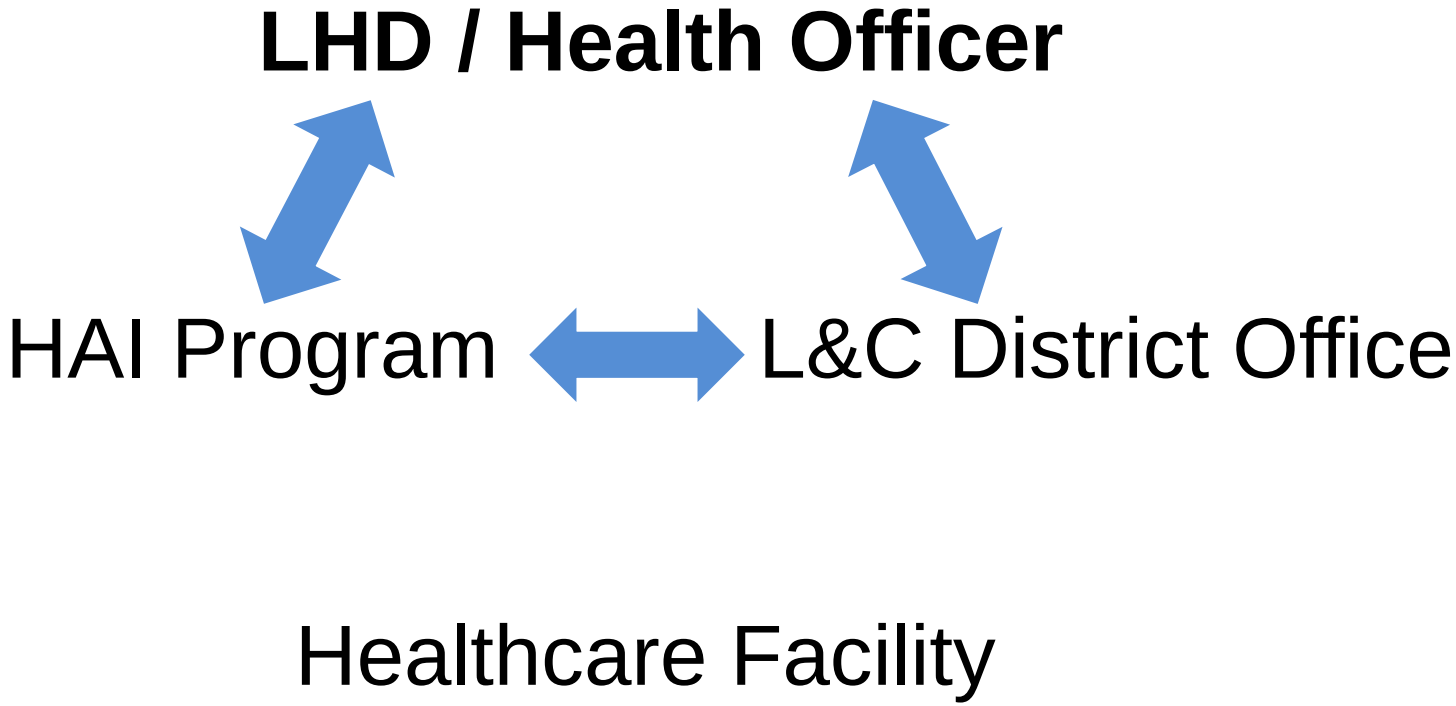
- Ensure healthcare facilities are in compliance with applicable state and federal laws and regulations
- Receive reports of unusual occurrences and outbreaks of HAI

Roles and Responsibilities

Coordination:

- HAI Program provides expert guidance to LHD
- LHD determines follow up actions for healthcare facility
- L&C ensures facility implements LHD recommendations and corrects regulatory deficiencies

Roles and Responsibilities



Roles and Responsibilities

LHD / Health Officer

HAI Program

L&C District Office

Healthcare Facility

Roles and Responsibilities

LHD Health Officer:

- "Shall take whatever steps deemed necessary for the investigation and control of the disease, condition, or outbreak reported"

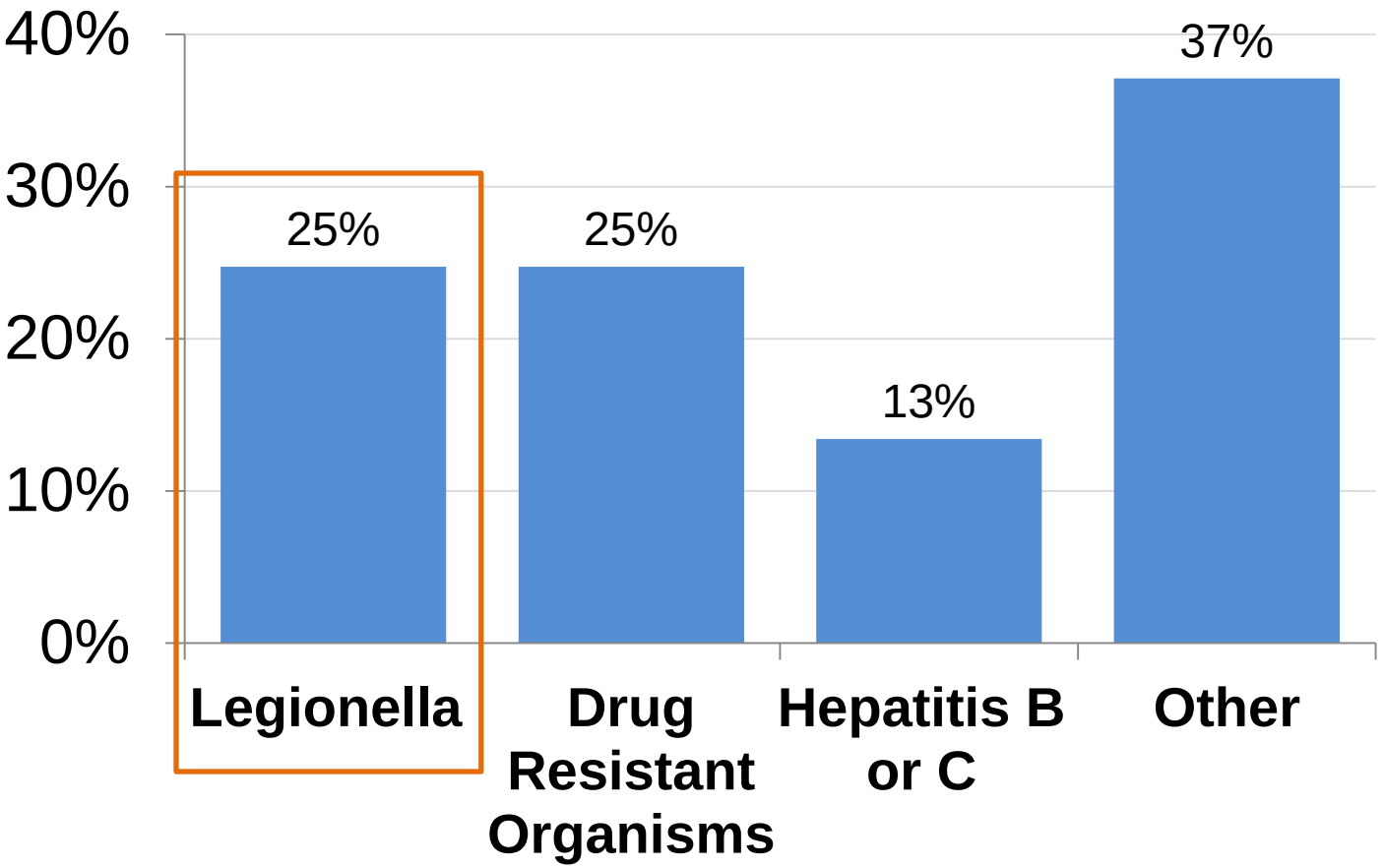
California Code Regulations 17 § 2501
Health Safety Code § 120175

Roles and Responsibilities

HAI Program assistance to LHD:

- 61 (63%) of 97 consultations (2015-2016) included three pathogen types:
    1. *Legionella*
    2. Drug resistant organisms
    3. Hepatitis B and C

HAI Program Assistance by Pathogen, 2015-2016



II. Legionnaires' Disease Epidemiology

Legionnaires' Disease Epidemiology

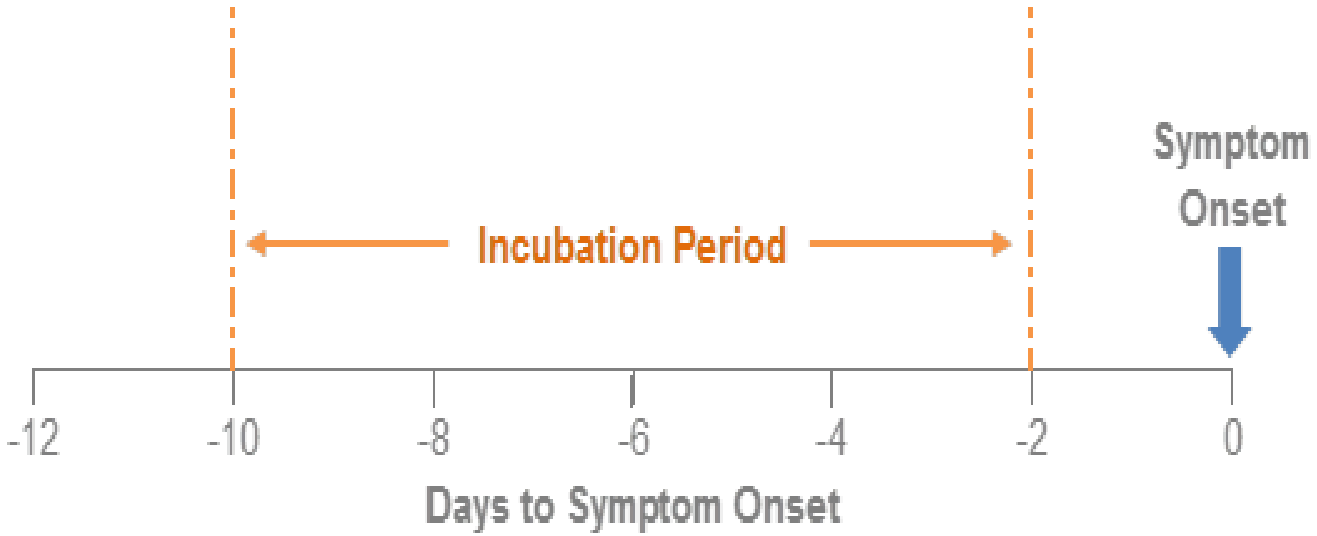
Legionnaires' Disease (LD):

- Pneumonia caused by *Legionella* species bacteria
- LD is often severe, requiring hospitalization
- Transmission occurs through inhalation or aspiration of water contaminated with *Legionella*

Legionnaires' Disease Epidemiology

Incubation period:

- 2-10 days prior to onset of symptoms



Legionnaires' Disease Epidemiology

Laboratory testing:

- Optimal testing requires urine antigen test AND culture of lower respiratory tract specimens using selective media
- Urine antigen test is sensitive for *Legionella pneumophila* serogroup 1; does not reliably detect other serogroups

Legionnaires' Disease Epidemiology

Patient risk factors:

- Renal or hepatic failure
- Diabetes
- Smoking
- Systemic malignancy
- Immune system disorders
- Age > 50 years

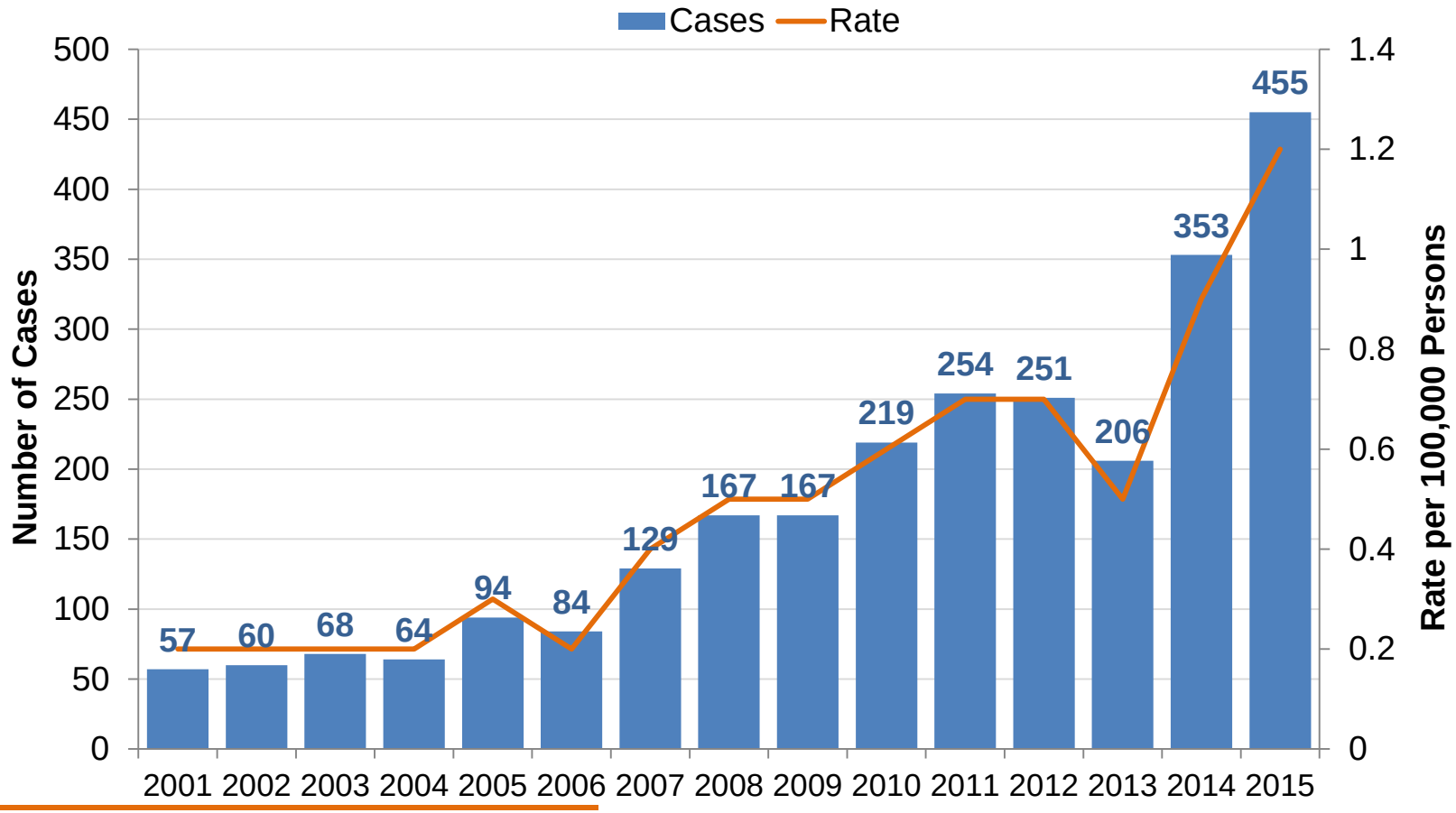
Legionnaires' Disease Epidemiology

Healthcare facilities can be high-risk settings for transmission:

- Have large, complex water systems
- Vulnerable patient and/or resident populations

Legionellosis by Year of Illness Onset, California 2001-2015

Source: CDPH Infectious Diseases Branch



Legionnaires' Disease Epidemiology

HAI Program assistance to LHD:*

- 14 LD consultations in 2015
  - 50% in Skilled Nursing Facilities

- 10 LD consultations in 2016
  - 70% in Skilled Nursing Facilities

**Not representative of all healthcare-associated LD cases/clusters in CA*

III. Steps for Investigating Healthcare-Associated Legionnaires' Disease

Investigation Quicksheet

California Department of Public Health

Healthcare-Associated Legionnaires' Disease Investigation Quicksheet

Legionnaires' Disease (LD)

- Legionnaires' disease (LD) is pneumonia caused by *Legionella* species bacteria. LD is often severe, requiring hospitalization. Patient risk factors include renal or hepatic failure, diabetes, smoking, systemic malignancy, immune system disorders, and age greater than 50 years.
- Transmission occurs through inhalation or aspiration of water contaminated with *Legionella*. The incubation period is 2-10 days. Standard precautions should be used when caring for hospitalized patients with LD.
- *Legionella* are found naturally in fresh water, are chlorine tolerant, and proliferate in warm, stagnant water systems.
- Hospitals and other healthcare facilities often have large, complex water systems, making them potentially high risk settings for transmission of *Legionella* to vulnerable patients or residents. Centers for Disease Control and Prevention (CDC) recommend all healthcare facilities have a water management program to control *Legionella*.

Laboratory Testing Considerations

- Optimal testing for *Legionella* requires both a urine antigen test AND culture of lower respiratory tract specimens using selective media

Legionnaires' Disease Case Classification

Local health departments (LHD) should review patients' clinical, radiographic and microbiologic information and classify reported cases of LD using the Council of State and Territorial Epidemiologists' case classifications:[1]

- **Suspected**: a clinically compatible case that meets at least one of the presumptive (suspect) laboratory criteria (nucleic acid assay, specified stains, etc.).
- **Confirmed**: a clinically compatible case that meets at least one of the confirmatory laboratory criteria: positive test for *Legionella pneumophila* serogroup 1 antigen in urine, *Legionella* culture of respiratory secretions or other sterile site, or seroconversion in specific antibody titer to *Legionella pneumophila* serogroup 1 using validated reagents.

Review chest radiology findings and/or a provider diagnosis to assign the appropriate LD classification.

Healthcare-Associated LD Definitions

A patient meets the CDC surveillance definition for healthcare-associated LD if he/she had an overnight stay in a hospital or long-term healthcare facility (i.e., skilled nursing or other healthcare facility, not

Healthcare-Associated LD Investigation Quicksheet

- Quicksheets are available online at: www.cdph.ca.gov/HAI
- Click on “Public Health Partners”

Healthcare-Associated LD Quicksheet:

http://www.cdph.ca.gov/programs/hai/Documents/HA_LegionnairesDiseaseQuicksheetFebruary2017.pdf

Investigation Steps

Main steps:

1. Ensure patient meets surveillance criteria for LD and HAI
2. Case Reporting
3. Follow up with healthcare facility

Investigation Steps: Classify Case

1. Verify case meets Council of State and Territorial Epidemiologists' (CSTE) case definition for LD:
   - Confirmed vs. suspect
   - Laboratory evidence must be corroborated with clinical or radiographic evidence of pneumonia

Investigation Steps: Classify Case

Urine antigen tests:

- Antigen from previous *Legionella* infection can be excreted in urine for months after convalescence and antibiotic treatment
- May lead to positive urine antigen tests despite no clinical signs and symptoms

Investigation Steps: Classify Case

2. Establish pneumonia symptom onset date
3. Document all recent healthcare exposures that occurred in prior two weeks

Investigation Steps: Classify Case

4. Identify healthcare facilities patient was an inpatient or resident of during incubation period
5. Determine if patient meets “definite” or “possible” healthcare-associated LD criteria

Investigation Steps: Definitions

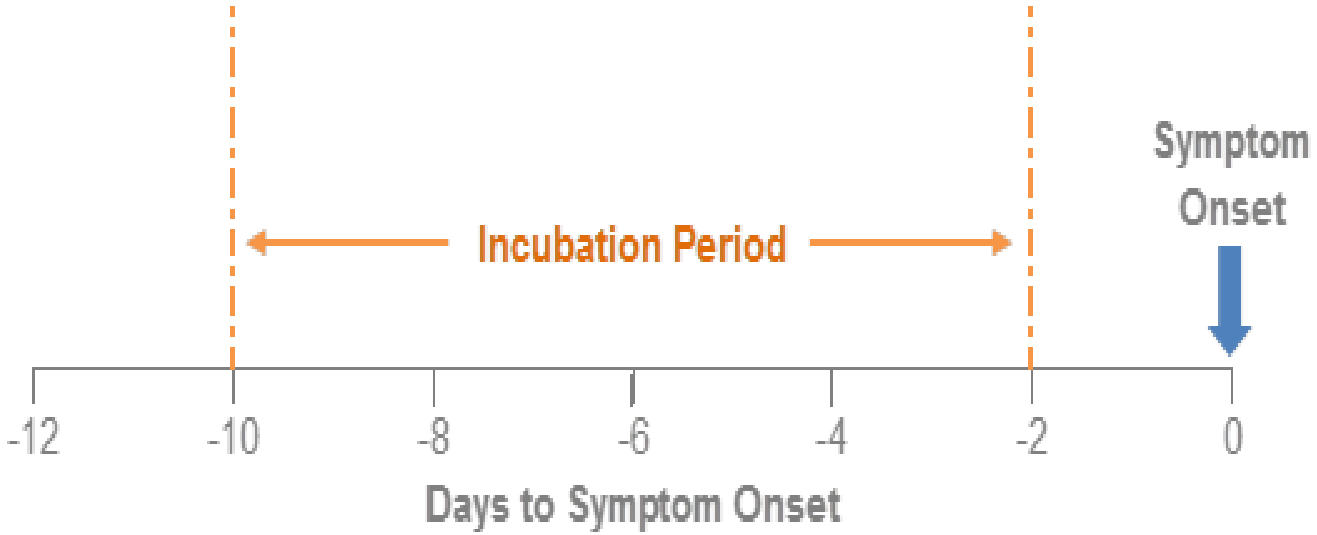
Healthcare-associated LD:

- A patient or resident with LD who had an overnight stay in a healthcare facility during the incubation period

Investigation Steps: Definitions

Incubation period:

- 2-10 days prior to onset of symptoms



Investigation Steps: Definitions

Healthcare-associated LD:

- Definite: a patient that was hospitalized or a resident in one or more healthcare facilities during the *entire* incubation period
- Possible: a patient that was hospitalized or a resident in one or more healthcare facilities for a *portion* of the incubation period

Investigation Steps

Main steps:

1. Identify patient meets surveillance criteria for LD and HAI
2. Case Reporting
3. Follow up with healthcare facility

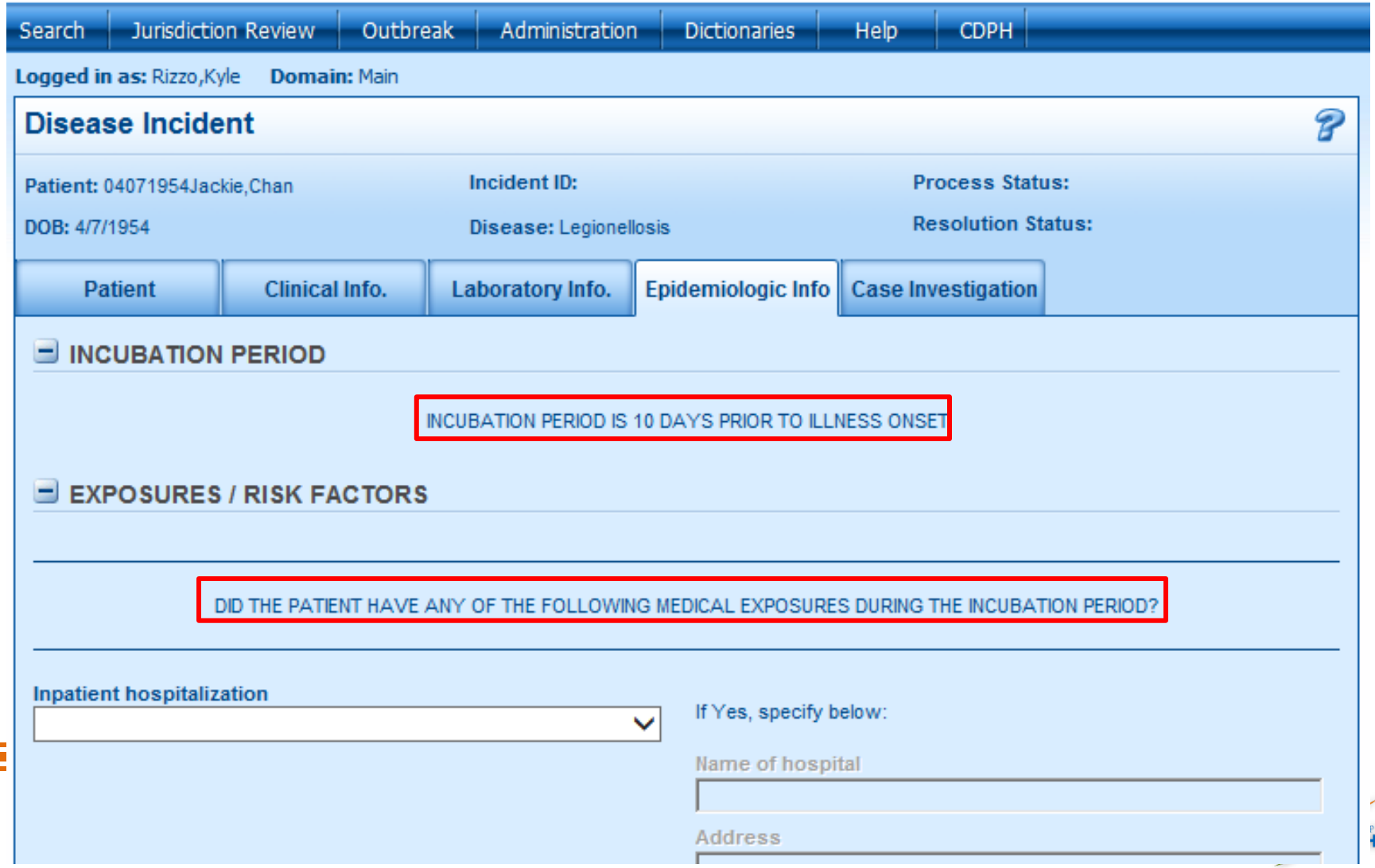
Investigation Steps: Reporting

Healthcare-associated LD cases:

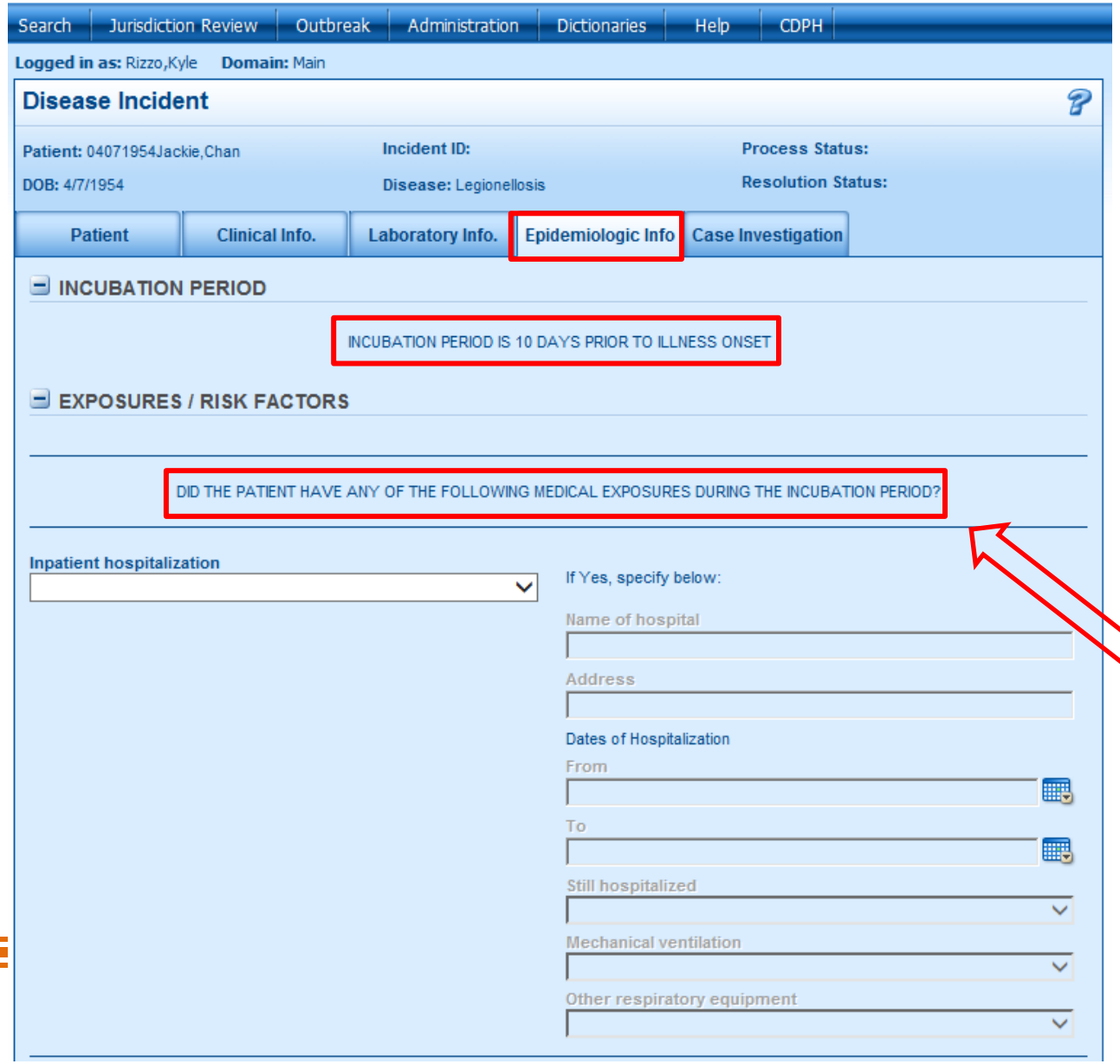
- Healthcare facility must report a “definite” case of healthcare-associated LD to their L&C District Office as an unusual occurrence
- LHD should notify the HAI Program when a “definite” healthcare-associated LD case is identified

Investigation Steps: Reporting

CalREDIE:



Investigation Steps: Reporting



Only include healthcare exposures that occurred <u>during the incubation period</u> in Epidemiologic Info tab of CalREDIE

California Department of PublicHealth

Investigation Steps

Main steps:

1. Identify patient meets surveillance criteria for LD and HAI
2. Case Reporting
3. Follow up with healthcare facility

Investigation Steps: Follow Up

LHD should follow up with a healthcare facility when:

- Facility has one confirmed case of "definite" healthcare-associated LD

OR

- Facility has two or more cases of "possible" healthcare-associated LD (within 6 months)

Investigation Steps: Follow Up

Healthcare facility should:

1. Perform retrospective and prospective case surveillance
   - Review records to identify any previous healthcare-associated LD cases in the past 6 months
   - Prospective surveillance should continue for at least two months

Investigation Steps: Follow Up

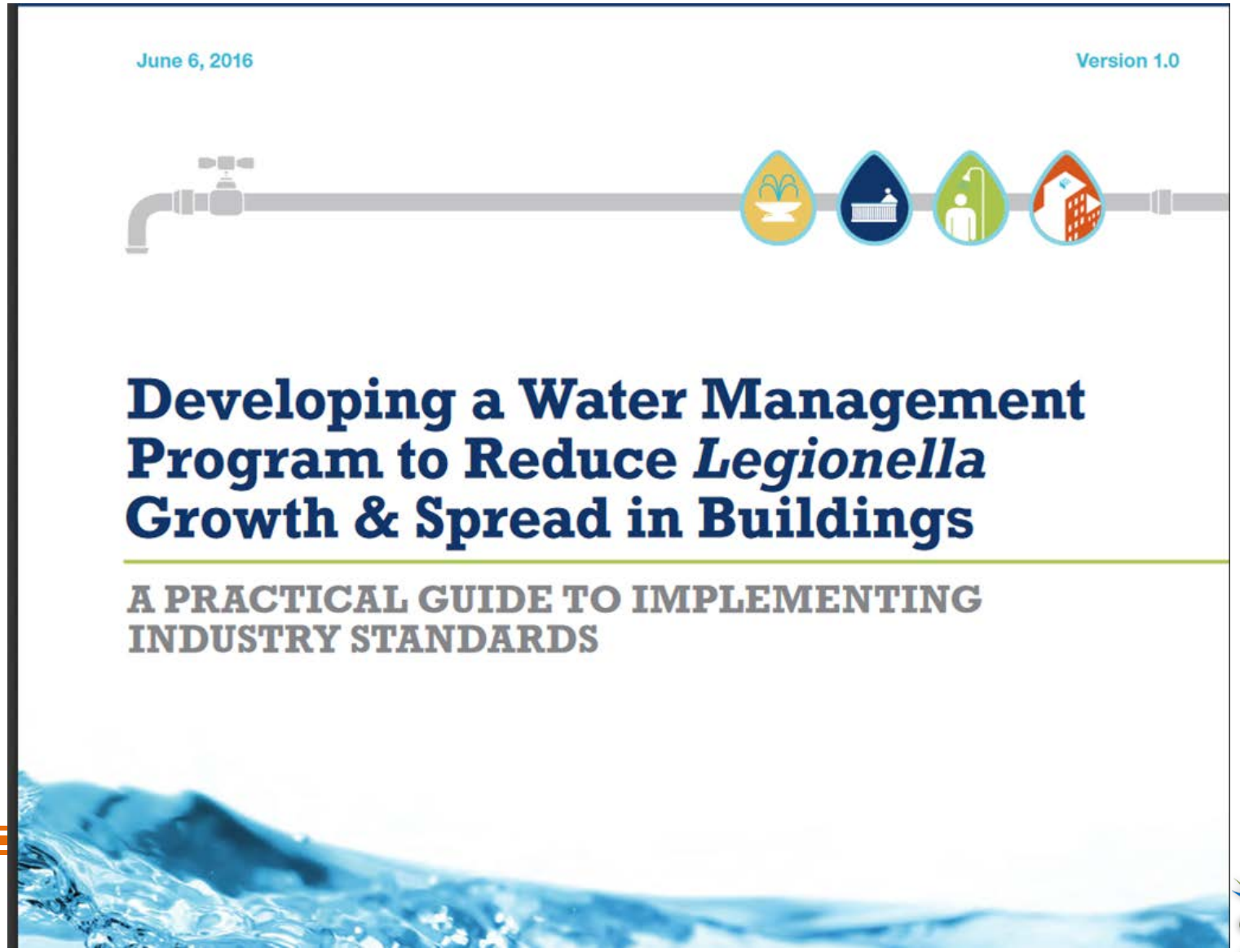
Healthcare facility should:

2. Notify transfer hospitals receiving patients with acute respiratory symptoms to suspect and test for LD

3. Develop a Water Management Program (WMP) to control *Legionella*; if facility has existing WMP, share with LHD and L&C District Office

CDC Water Management Program Toolkit

https://www.cdc.gov/legionella/maintenance/wmp-toolkit.html



Investigation Steps: Follow Up

Full investigations:

- The decision to pursue a full investigation should be made on a case-by-case basis by the LHD
- Full investigations are recommended as a best practice to reduce the risk of ongoing *Legionella* transmission to other patients/residents

Investigation Steps: Follow Up

The HAI Program and CDC recommend LHD perform a full investigation for a facility when:

- ≥1 case of "definite" healthcare-associated LD is identified ***OR…***
- ≥ 2 cases of "possible" healthcare-associated LD are identified (within 6 months of each other) ***AND…***

Investigation Steps: Follow Up

- The LHD assessment finds there is a high likelihood that exposure to *Legionella* occurred at the identified facility

Investigation Steps: Follow Up

Example 1:

- A 76 year old resident of a skilled nursing facility (SNF) develops Legionnaires' disease
- After review of the resident's history, the LHD learns the resident had not left the facility in over six months
- Resident only had exposures to water at the SNF during the incubation period

Investigation Steps: Follow Up

Example 2:

- A 76 year old resident of a SNF develops Legionnaires' disease
- After review of the resident's history, the LHD learns the resident was hospitalized for pneumonia, while living at home, and treated empirically without a *Legionella* test, one month prior

Investigation Steps: Follow Up

Full investigations include:

- Retrospective and prospective case surveillance
- Develop or revise WMP protocols
- Evaluation of potential environmental exposures and assessment of water system

Investigation Steps: Follow Up

Full investigations include:

- Environmental sampling (i.e., water testing) with cultures processed by CDC ELITE certified laboratory
- Comparison of clinical and environmental isolates (if possible)
- Decontamination of environmental sources if identified

Investigation Steps: Follow Up

- The full investigation may be performed by LHD (all or in part) and/or by an experienced environmental consultant contracted by the healthcare facility

Investigation Steps: Follow Up

- Interim control measures may be necessary based on findings of facility assessment and consideration of exposures (e.g., patient took showers, given ice, tap water; no facility WMP)
- If environmental samples are obtained, control measures should be implemented until water test results are received and further action can be taken, if necessary

Investigation Steps: Follow Up

Interim control measures include:

- Avoid tap water for drinking by patients/residents; use bottled water or install point-of-use filters
- Avoid ice from ice machines
- Avoid using showers in areas of concern or install point-of-use filters

Investigation Steps: Follow Up

Interim control measures include:

- Ensure sterile water is used for filling reservoirs of respiratory devices and rinsing respiratory equipment
- Shut down sources (e.g., whirlpool spa, decorative fountain) that have potential to transmit *Legionella*

Investigation Steps: Follow Up

Activities that may continue at the healthcare facility:

- Use of tap water for hand hygiene
- Use of tap water for dish washing

Investigation Steps: Follow Up

- Healthcare facilities on water restriction should continue to flush their water systems (not in the presence of patients/residents) to prevent water stagnation that could cause additional proliferation of *Legionella*

IV. Lessons Learned from a Local Health Department's Outreach Strategy

LHD Outreach Strategies: Example

Fresno County Department of Public Health (DPH):

- Four cases of healthcare-associated LD in 18 months
- Dr. Ken Bird, Health Officer, issued Health Advisory in October 2016 to local medical providers recommending enhanced surveillance for LD

LHD Outreach Strategies: Example

Fresno County DPH:

- Sent letter in November 2016 advising healthcare facilities on their roles in preventing LD in healthcare environment
- Described importance of a Water Management Program

Fresno County DPH LD Prevention Letter

County of Fresno
DEPARTMENT OF PUBLIC HEALTH
David Pomaville, Director
Dr. Ken Bird, Health Officer

November 22, 2016

Recommendations for Legionnaires' Disease Surveillance and Implementation of a Water Management Program to Reduce *Legionella* Growth

To Whom It May Concern:

The purpose of this letter is to advise you of your role in prevention of Legionnaires' disease in the healthcare environment.

Legionnaires' disease is a pneumonia caused by *Legionella* bacteria. Transmission occurs when water contaminated with the bacteria is aerosolized and inhaled or, less frequently, aspirated. The pneumonia can be serious, especially in elderly patients and patients with immunosuppression or certain chronic illnesses. The incubation period for Legionnaires' disease is 2-10 days prior to the onset of symptoms.

Legionella bacteria are found naturally at low levels in fresh water (e.g., drinking water), are chlorine tolerant, and proliferate in warm, stagnant water systems. Hospitals and long-term healthcare facilities (e.g., skilled nursing facilities) may have large, complex water systems, making them potentially high-risk settings for transmission of *Legionella* to vulnerable patients or residents.

LHD Outreach Strategies: Example

Fresno County DPH:

- Late December 2016 a “definite” case of healthcare-associated LD was identified in a Fresno County SNF
- SNF contacted Fresno County L&C District Office; control measures were put in place

Fresno Bee Article

51°
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The Fresno Bee

FULL MENU SPORTS NEWS ENTERTAINMENT OPINION

LOCAL JANUARY 13, 2017 3:30 PM

Legionnaires' disease diagnosed in Fresno nursing home patient

VIDEOS

Fresno Mayor Lee Brand and sanctuary city status

Fresno Mayor Lee Brand and sanctuary city status

First F-35C jets arrive at Lemoore Naval Air Station

California Department of PublicHealth

Fresno Bee Article

Source: http://www.fresnobee.com/news/local/article126494379.html

"In October, Bird sent an advisory to health care institutions to be on the lookout for Legionnaires' disease.

And in a follow-up letter in November, Bird recommended that "patients admitted to a hospital with pneumonia and underlying risk factors should be tested for Legionella ... this includes testing patients with acute pneumonia admitted to a hospital from a skilled nursing facility or long-term care facility, and patients who develop pneumonia during an inpatient hospitalization." A simple urine test is used to determine Legionnaires' disease.

Bird also recommended hospitals and long-term care institutions follow water management guidelines from the federal Centers for Disease Control and Prevention to prevent and control the growth of the bacteria in their water systems."

LHD Outreach Strategies: Example

Lessons learned:

- Proactive education and outreach may
  - Increase timeliness of LD case diagnosis and identification
  - Increase reporting by providers and facilities

LHD Outreach Strategies: Example

Lessons learned:

- Proactive education and outreach may
  - Enable prompt LHD intervention and implementation of control measures to interrupt transmission
  - Influence healthcare facilities to adopt and maintain a WMP

Summary

1. Apply surveillance definitions to identify healthcare-associated LD cases
2. Healthcare facility follow up should include case surveillance and WMP development; full investigations considered on case-by-case basis
3. LHD outreach efforts regarding HAI have meaningful impacts

Thank you for participating!

Next HAI Investigation Webinar:

Carbapenem-resistant Enterobacteriaceae (CRE) Investigations

Thursday, March 23, at 11am

Questions?

The HAI Program is available for consultation.
Contact us by email:
HAIProgram@cdph.ca.gov

Additional Resources

- CDPH HAI Program Healthcare-Associated LD Investigation Quicksheet: http://www.cdph.ca.gov/programs/hai/Documents/HA_LegionnairesDiseaseQuicksheetFebruary2017.pdf
- CDPH information about legionellosis: https://www.cdph.ca.gov/HEALTHINFO/DISCOND/Pages/Legionellosis.aspx

Additional Resources

- CDC *Legionella* website: http://www.cdc.gov/legionella/index.html
- CDC information on Legionnaires' disease for health departments: http://www.cdc.gov/legionella/health-depts/index.html

Additional Resources

- CDC tools for investigation of *Legionella* outbreaks and clusters: http://www.cdc.gov/legionella/health-depts/inv-tools-cluster/index.html
- CDC Water Management Program to control the growth of *Legionella*: http://www.cdc.gov/legionella/maintenance/wmp-toolkit.html