

TO:

Genesee County Health Department

FROM:

Centers for Disease Control and Prevention
National Center for Immunization and Respiratory Diseases
National Center for Environmental Health

DATE: October 7, 2016

REFERENCE: Briarwood *Legionella* Investigation

INTRODUCTION**Purpose of the Investigation**

Acute and long-term care healthcare facilities can present exposure risks for *Legionella* bacteria because they have complicated water systems and provide care to vulnerable populations such as persons aged ≥ 50 years, smokers, and persons with underlying medical conditions such as chronic lung disease or immunosuppression. When persons housed in a healthcare facility are diagnosed with Legionnaires' disease, the facilities they inhabited during the time of possible exposure must be investigated for potential sources of ongoing *Legionella* transmission. Because *Legionella* live and grow in building water systems, investigations for Legionnaires' disease require an environmental assessment to identify potential sources of exposure. *Legionella* growth and spread in building water systems can be reduced through the implementation of water management programs. A patient admitted August 5, 2016 to Heartland Health Care Center — Briarwood, known as "Briarwood," was documented to have developed signs of pneumonia on August 8, 2016. Following transfer to a hospital on August 10, 2016, the patient was diagnosed with Legionnaires' disease.

Background

Legionellosis is a respiratory disease caused by inhalation of aerosolized droplets of water contaminated with the bacterium *Legionella* and can present as either Legionnaires' disease or Pontiac fever. Legionnaires' disease is a severe, sometimes fatal pneumonia, while Pontiac fever is a milder illness without pneumonia that generally resolves on its own. The incubation period for Legionnaires' disease is most commonly 2 to 10 days after exposure, with an average of 5 to 6 days.¹

To be considered confirmed, a case of Legionnaires' disease must be clinically compatible (i.e., evidence of clinical or radiographic pneumonia) and meet one of the confirmatory laboratory criteria:

- By culture: isolation of any *Legionella* organism from respiratory secretions, lung tissue, pleural fluid, or other normally sterile fluid;
- By detection of *Legionella pneumophila* serogroup 1 antigen in urine using validated reagents; or
- By seroconversion: fourfold or greater rise in specific serum antibody titer to *Legionella pneumophila* serogroup 1 using validated reagents.²

Exposure to *Legionella* in natural freshwater environments, such as lakes or streams, does not lead to disease; however, in manmade water systems, *Legionella* can grow and be transmitted to susceptible hosts, including

¹ Phin N, Parry-Ford F, Harrison T, et al. Epidemiology and clinical management of Legionnaires' disease. *Lancet Infect Dis.* 2014;14(10):1011–21.

² CDC. CSTE Position Statement: Strengthening Surveillance for Travel-Associated Legionellosis and Case Definitions for Legionellosis. Available at: <http://www.cdc.gov/legionella/health-depts/inv-tools-single/cste-position-statement.html>

persons aged 50 years or older, smokers, and persons with underlying medical conditions such as chronic lung disease or immunosuppression. Because they host susceptible populations and often have cooling towers and complex premise plumbing systems, *Legionella* growth and transmission are particular concerns for water systems in hospitals and other healthcare facilities.³ CDC typically recommends that a full investigation for the source of *Legionella* be performed when:⁴

- ≥1 case of **definite** healthcare-associated Legionnaires' disease (a case in a patient who spent the entire 10 days prior to onset of illness in a healthcare facility) is identified, or
- ≥2 cases of **possible** healthcare-associated Legionnaires' disease (cases in patients who spent a portion of the 10 days before symptoms began in a healthcare facility) are identified within 6 months of each other.

However, where there is a history of Legionnaires' disease cases associated with a facility and there is concern that a potential risk for *Legionella* transmission still exists, investigating even a single case of possible healthcare-associated Legionnaires' disease may be prudent.

The Setting

Briarwood is a one-story rehabilitation and long-term care facility with 117 patient rooms. Briarwood was first constructed in 1969 (hot water system #1), and a 16,572 square foot addition was completed (see **Appendix A**) in 2009 (hot water system #2). The two wings of the facility share a cold water system but utilize independent recirculating hot water systems. Briarwood is part of a system of healthcare centers owned by Heartland that includes over 50 rehabilitation and long-term nursing home care centers throughout the United States.

METHODS

Details of the patient's medical history, clinical course, and possible exposures to water were reviewed with staff from Genesee County Health Department (GCHD) and Briarwood.

On August 24, 2016, CDC and GCHD conducted an environmental assessment of the facility. Briarwood facility and engineering staff provided CDC and GCHD staff a tour of the mechanical rooms and patient areas. The Briarwood staff confirmed that there are no cooling towers or decorative fountains located at the facility. Specific areas assessed included patient rooms, the physical therapy shower, mechanical rooms, and hot water storage tanks. Briarwood does have one therapy tub but it is rarely used and was offline for the entire duration of the patient's stay. The environmental assessment included measurements of free and total chlorine, pH, and temperature at representative points proximal and distal to the central water distribution lines and throughout the facility. Two environmental swabs and three bulk water samples were obtained for *Legionella* culture and transferred to CDC for processing. A water management program was not available, so CDC staff shared information on how to develop one and provided recommendations to mitigate potential *Legionella* growth.

RESULTS

Patient Exposures and Disease Surveillance

Upon review, the patient was noted to have multiple underlying risk factors for Legionnaires' disease (77 years of age with history of lung cancer requiring partial pneumonectomy, former smoker, and chronic obstructive pulmonary disease requiring supplemental oxygen). The patient's exposures to water at Briarwood were minimal, however, and the bulk of time during which the patient likely contracted *Legionella* infection occurred

³ Garrison LE, Kunz JM, Cooley LA, et al. Vital Signs: Deficiencies in Environmental Control Identified in Outbreaks of Legionnaires' Disease — North America, 2000–2014. *MMWR*. 2016;65(22):557–561.

⁴ CDC. Developing a Water Management Program to Reduce *Legionella* Growth and Spread in Buildings. Available at: <http://www.cdc.gov/legionella/maintenance/wmp-toolkit.html>

before the patient arrived at Briarwood. The patient did not shower while at Briarwood; the bathroom adjacent to the patient's room contained only a sink and toilet. The patient was not exposed to the therapy tub. The patient was not able to walk independently and did not travel outdoors. The patient was not documented to be at risk for aspiration of liquids and was on a regular diet.

Water Management and Environmental Assessment

- Cold water free chlorine disinfectant level (1.5 mg/L) entering the building from water main was within EPA recommended limits.
- Adequate cold water free chlorine disinfectant levels (range: 0.17 mg/L to 1.5 mg/L) were observed at representative distal locations throughout the facility.
- Hot water in hot water system #2 was stored at a temperature (140°F), which is not conducive for *Legionella* growth.
- Temperatures (127.4 to 138.7°F) not conducive to *Legionella* growth were observed at the end use points distal to the water storage tanks in hot water system #2.
- Hot water temperature in hot water system #1 storage tank (105.9°F) was within the amplification zone for *Legionella* growth.
- Water systems #1 and #2 utilize thermostatic mixing valves on all point-of-use fixtures. Water system #1 is missing mixing valves at 3 point-of-use fixtures, but these mixing valves have been obtained by maintenance staff and are in the process of being installed.
- A low water usage fixture was identified in the physical therapy room: the bathroom training room shower was rarely used. A free chlorine level of 0.17mg/L was observed from first flush.
- Sediment was observed in water heaters in both water system #1 and #2.
- No *Legionellae* were recovered from the five samples obtained for culture at Briarwood (see **Appendix B**).

CONCLUSIONS AND RECOMMENDATIONS

- According to current CDC recommendations,⁵ Briarwood clinical staff should consider the diagnosis of Legionnaires' disease in all patients who develop pneumonia after admission to Briarwood and pursue an appropriate work-up, including clinical evaluation, chest imaging, testing (using urinary antigen test and culture of lower respiratory secretions for *Legionella*), and treatment as indicated. Ongoing monitoring for occurrence of Legionnaires' disease among Briarwood patients is important for ensuring there is no transmission at the facility.
- Facility management should implement a water management program based on best practices identified in CDC's toolkit: Developing a Water Management Program to Reduce *Legionella* Growth and Spread in Buildings.⁶
- The water system had adequate chlorine levels throughout and much of the system had temperatures not conducive to amplification of *Legionella*. However, we did identify a few measures that would reduce the risk of *Legionella* growth in Briarwood's water system. We suggest that Briarwood management:
 - Increase hot water heater temperature in hot water system #1 to 140°F or greater. Hot water maintained above 140°F helps to prevent the growth of *Legionella* in hot water systems. Ensure 3 missing mixing valves are installed (as planned) to prevent scalding.
 - Ensure hot water return temperature in hot water system #1 recirculating system is 120°F or greater.

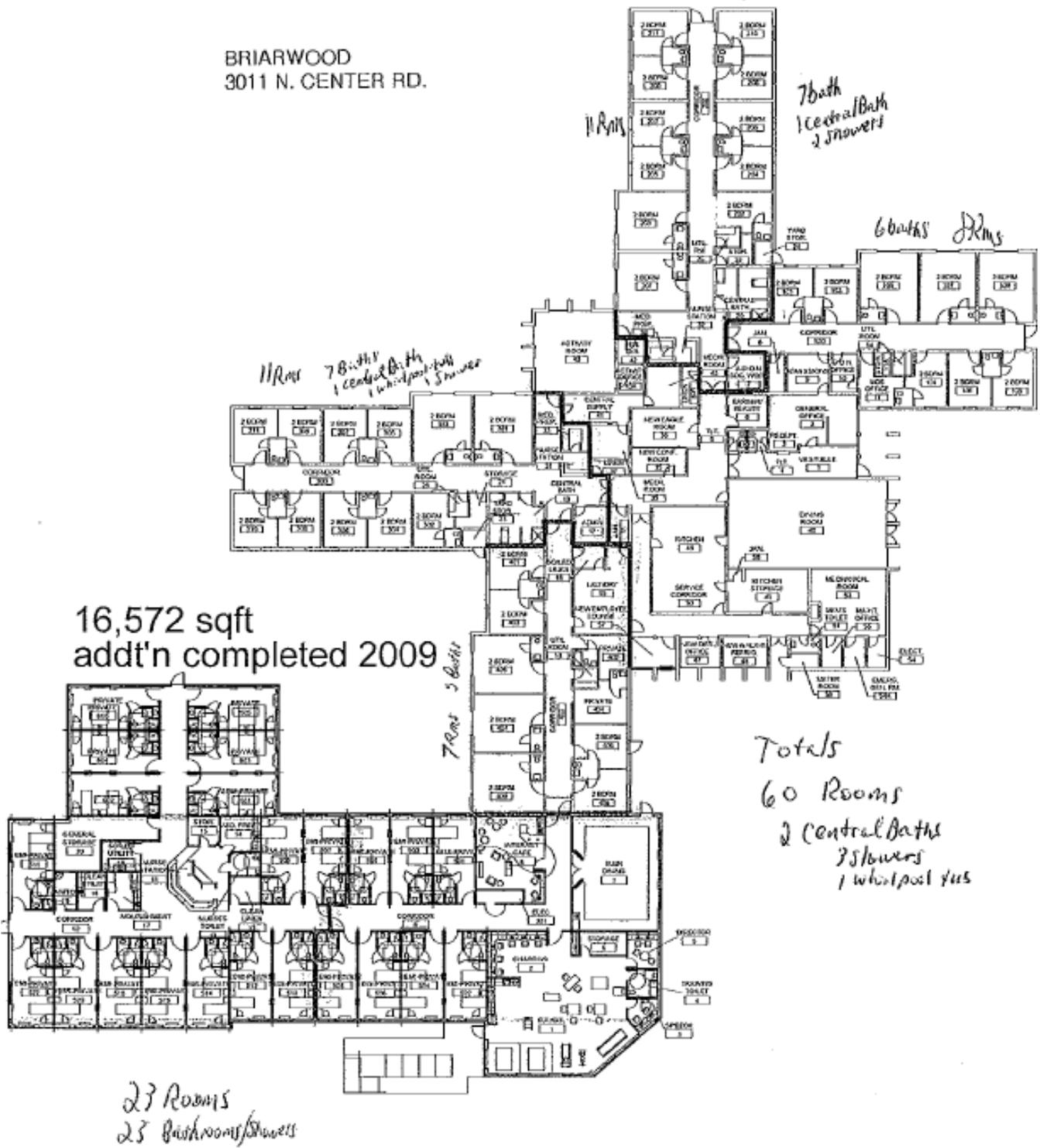
⁵ CDC. What Clinicians Need to Know about Legionnaires' Disease. Available at: <http://www.cdc.gov/legionella/downloads/fs-legionella-clinicians.pdf>

⁶ CDC. Developing a Water Management Program to Reduce *Legionella* Growth and Spread in Buildings. Available at: <http://www.cdc.gov/legionella/maintenance/wmp-toolkit.html>

- Consider flushing the water heaters at least monthly; flush water from bottom of heater until sediment is removed and water runs clear.
- Consider implementing flushing procedures for vacant rooms and any rarely used fixtures, such as the physical therapy room shower and the therapy tub, until a chlorine residual is detected at the point of use.

APPENDIX A. MAP OF BRIARWOOD BUILDINGS

BRIARWOOD
3011 N. CENTER RD.





APPENDIX B. LEGIONELLA ENVIRONMENTAL SAMPLING TEST RESULTS



Study: Briarwood MI Study

Project ID	DASH#	Collected	Processed	Sample Data Description	Test Results	Colony Counts	Comments
M116-1-001	3015350194	08/24/2016	08/25/2016	Briarwood Rm 308 bathroom sink	Final Identification = No Legionella Isolated		
M116-1-002	3015350195	08/24/2016	08/25/2016	Briarwood Rm 308 bathroom sink (hot)	Final Identification = No Legionella Isolated		
M116-1-003	3015350196	08/24/2016	08/25/2016	Physical therapy shower	Final Identification = No Legionella Isolated		
M116-1-004	3015350197	08/24/2016	08/25/2016	Physical therapy shower (hot) - tempura	Final Identification = No Legionella Isolated		
M116-1-005	3015350198	08/24/2016	08/25/2016	nurse room "Chp's office" water storage	Final Identification = No Legionella Isolated		