

Nosocomial (Health Care–Associated) Legionnaire’s Disease

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KEYWORDS

• Nosocomial • Health care–associated • *Legionella* • Outbreaks • Prevention

KEY POINTS

- Nosocomial legionellosis is underappreciated as a cause of nosocomial pneumonia especially if there is a lack of awareness of the presence of *Legionella* spp with a hospital water supply.
- Legionnaire’s disease should be suspected especially if no other etiology for pneumonia is found.
- Prevention of legionnaire’s disease focuses on reducing the reservoir within water systems and includes super heating, ultraviolet light, chlorination, silver-copper ionization, and distal filtration.

INTRODUCTION

Legionella was first identified in 1976 as a result of a community outbreak of severe pneumonia among participants of the American Legion Convention in Philadelphia, Pennsylvania.^{1,2} Since then there have been numerous outbreaks of legionnaire’s disease (LD) in health care settings. Outbreaks are commonly associated with facilities that have large water systems, such as hotels and resorts, long-term care facilities, and hospitals. Thus, hospitals are increasingly facing the potential for nosocomial transmission. This article reviews the epidemiology of health care–associated (HCA)

Funding: None.

Conflict of Interest: No conflict (S. Agarwal and V. Abell). Recent research funding, Cembra and Pfizer; Scientific Advisory Board Member, Allergan, Cembra, Merck, MotifBio, Nabriva, Pfizer, and Tetrphase (T.M. File).

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Infect Dis Clin N Am ■ (2016) ■–■
<http://dx.doi.org/10.1016/j.idc.2016.10.011>

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LD, reviews characteristics of several HCA outbreaks, and discusses strategies to prevent HCA infection.

EPIDEMIOLOGY

Although *Legionella* spp are uncommon causes of nosocomial infection, the Centers for Disease Control and Prevention (CDC) recommends a high degree of suspicion³; this is especially when there are cases of nosocomial pneumonia caused by undefined etiology. Nosocomial LD should be considered whenever there has been a laboratory documented case within a health care facility in the past or *Legionella* has been documented from surveillance cultures of health care water sources. The CDC guidance document on the prevention of HCA pneumonia defines laboratory-confirmed cases to be “definite” HCA LD if a patient has spent equal to or greater than 10 days continuously in a health care facility before the onset of LD, or “possible” HCA LD if a patient has spent 2 to 9 days in a health care facility before the onset of LD.³ When a single case of laboratory-confirmed definite health care-associated LD is identified, or when two or more cases of laboratory-confirmed, possibly HCA LD occur within 6 months, an outbreak investigation is recommended.³ In contrast, other policies support a risk assessment of health care transmission of *Legionella* based on quantification of the organism from a facility’s water sources.⁴ Many facilities apply a “30% action threshold” whereby decontamination of the water system is performed when *Legionella* is recovered from 30% or more of the tested sites.⁵ However, the utility of this policy has been questioned; and nosocomial transmission has occurred with less than 30% of sites tested positive. A survey of peer-reviewed publications suggests the 30% cutoff value has a sensitivity of 59% and specificity of 74%, which implies a 41% false-negative rate and 26% false-positive rate.⁵

Within the hospital setting, recognition of nosocomial pneumonia (NP) is crucial to identifying an outbreak. Key to this recognition is the input from microbiology, infectious disease services, and infection control personnel.⁶ The documentation of an outbreak within a health care setting to a certain extent depends on identifying identical strains or clones of the organism. Because *Legionella pneumophila* serogroup 1 expresses a conserved genome, the use of standard molecular techniques may be insufficient to accurately monitor an outbreak. Recently Bartley and colleagues⁷ have demonstrated the use of whole gene sequencing offers the potential to accurately identify outbreak strains. They used genomic epidemiology and whole gene sequencing to link *L pneumophila* serogroup 1 isolates from 2 patients from an outbreak with a clone that had been present in a hospital water supply.⁷

Nosocomial Sources and Transmission

Because *Legionella* amplifies in man-made water sources in the presence of warm water temperatures (20°C–45°C),⁸ nosocomial LD can occur as patients are exposed to such sources. Health care facilities are included in the types of buildings that have been associated with the transmission of *Legionella* to patients. Cases of HCA LD often arise from exposure to *Legionella* bacteria in hospital potable water distribution systems. Surveys have shown that *Legionella* colonizes the hot water distribution system in 12% to 70% of hospitals in specific geographic areas.^{9,10} In one study from Hungary, 90% of survey hospitals found *Legionella* in the water supply; most of the hospitals were greater than 30 years old.¹¹

Legionella spp are particularly likely to be found in pipes and water tanks of health care facilities when there is stasis, the presence of sediment, or biofilm. In addition, the

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