

Water Safety and *Legionella* in Health Care

Priorities, Policy, and Practice



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KEYWORDS

- Water-associated infections • Health care premise plumbing • Water safety plans
- Risk assessment • *Legionella* prevention

KEY POINTS

- Water has extensive uses in health care, and therefore there are multiple considerations for preventing water-associated infections in these settings.
- Although the health care setting is increasingly recognized as an important contributor to the burden of water-associated infections in the United States, especially those caused by opportunistic premise plumbing pathogens, health care-associated infections from water pathogens remain underappreciated. Many health care facilities do not have specific plans to address their prevention.
- The risk for water-associated infections in health care, such as *Legionella*, and triggers for control are building specific, and require individualized assessments related to multiple factors to determine prevention strategies.
- There are multiple, often competing, priorities regarding water in health care buildings, such as preventing pathogen growth and transmission, avoiding scald injury, reducing energy usage and costs, promoting conservation, and maintaining water security. Focusing on 1 aspect without consideration for the others could result in unintended consequences, such as water-associated infections.
- Effective water safety in health care requires a coordinated, multidisciplinary approach inclusive of facility administration, facilities management staff (eg, engineering), and clinical staff (eg, infection prevention and control, infectious diseases) for control of pathogens in the environment.

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INTRODUCTION

The treatment of drinking water by municipalities to reduce infectious diseases is one of the major public health accomplishments of the twentieth century in the developed world.¹ Now, more than a century from its first implementation in the United States, drinking water that is safe from pathogens is largely taken for granted. In addition, although the regulatory and oversight authority of public water utilities in the United States does not generally include premise plumbing (ie, water distribution within buildings and property lines), little consideration is given for water safety and quality in the potable water distribution system of buildings. Outbreaks caused by deficiencies in federally regulated public water utilities have decreased, but outbreaks associated with premise plumbing have increased,² indicating both the lack of attention to infectious disease transmission from this source and the missed opportunity for directed prevention.

Several pathogens related to water have been implicated in causing disease in humans, with varying routes of exposure (Fig. 1).^{3,4} An important distinction, especially when considering the control of these pathogens, is the nature of their association with water⁵:

- Water based: pathogens that naturally inhabit water and grow in water systems (eg, *Legionella* species that cause legionnaires' disease [LD])
- Waterborne: pathogens that do not replicate in water but can be transmitted by water, often as a result of fecal contamination (eg, *Escherichia coli* that cause gastroenteritis)
- Water related: pathogens that are associated with a vector that requires water for part of its life cycle (eg, dengue virus transmitted by mosquitoes)

In the United States, waterborne pathogens in drinking water are controlled by biocide treatment before distribution to customers (eg, buildings); organizations supplying the water are responsible for monitoring contaminants, including indicators of waterborne (ie, fecal) pathogens. In contrast, water-based pathogens are found in low numbers in natural bodies of water, and treatment plants do not specifically target or monitor levels. These pathogens, notably *Legionella* species, *Pseudomonas aeruginosa*, and nontuberculous mycobacteria (NTM), can grow in building water distribution systems; they are associated with free-living amoeba and/or biofilms, both of which can offer protection to the pathogens from disinfecting biocides in the water system.^{4,6} Water-based pathogens have been referred to as opportunistic premise plumbing pathogens, and the significance of their ecology for persistence and control in buildings has recently been reviewed.^{5,7}

This article mainly focuses on water-based pathogens; those that can multiply in building water distribution systems and for which primary prevention activities at the building level may be appropriate. From the many recent reviews on these pathogens and their management in health care settings,^{4,6-13} it now seems clear that increased actions regarding premise water distribution system safety are warranted, although they are not often prioritized.

WATER IN THE HEALTH CARE SETTING AND PATHOGENS

Health care facility water distribution systems are complex given the variation in building and campus sizes, health care delivery goals, and facility operations with variable water demands within the system. All of these factors can influence premise plumbing pathogen growth and persistence, sometimes in competing ways. In addition, different health care settings (eg, acute care hospitals, long-term care facilities)

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