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Collaton Consultancy Limited provide Expert Witness services, training, consultancy, and Authorising Engineer (Water) services relating to water treatment, Legionella and Pseudomonas aeruginosa.



GUIDANCE FOR MANAGING *LEGIONELLA* IN NURSING & CARE HOME WATER SYSTEMS DURING THE COVID-19 PANDEMIC

1. Why this guidance?

Whilst water systems may not seem to be high on the priority list during the COVID-19 pandemic it is important for the health and safety of staff, patients and visitors that water systems are managed safely. Evidence from China (Zhou et al., 2020) is that half of COVID-19 fatalities had experienced a secondary infection. This suggests patients are at increased risk of secondary infections both during recovery and for some months after. In Europe just under 10% of community acquired cases of Legionnaires' disease die but in healthcare, the death rate can rise to >25%. The potential risks for Legionnaires' disease and other waterborne infections may well be overlooked when planning for a rapid increase in the number of patients during the COVID-19 pandemic. This includes those suffering from COVID-19 and those transferred out of hospital to make room COVID-19 patients who may both have increased susceptibility to co-infection with other pathogens including *Legionella* during the pandemic as well as during the recovery and the gradual return to normal activities.

It is important to remember that water delivered at water system outlets is not sterile, even when complying with drinking water standards¹. In systems which are not well designed or managed, microorganisms which are naturally occurring in water, including *Legionella*, and *Pseudomonas aeruginosa* can increase to levels which can cause severe illness and even death in very susceptible patients and staff. Legionnaires' disease and the milder form, Pontiac fever, a flu like illness, is caused by the colonisation and growth of *Legionella* in water systems and associated equipment, including equipment used for ventilation and humidification. Aspiration² is another potential mode of infection especially in those patients with swallowing difficulties, nasogastric feeding tubes or when sucking ice.

2. What sort of buildings is this guidance aimed for?

This guidance is aimed at care homes, nursing homes and other residential settings where there are patients and residents being treated for COVID-19 or for patients with increased susceptibility to infections such as those transferred from hospitals to make way for COVID-19 patients. The ongoing COVID-19 pandemic has a significant potential to increase the risks of waterborne infections, including Legionnaires' disease. It is essential that appropriate testing of water systems and patients is carried out to protect both patients and staff from unrecognised outbreaks of waterborne infections including those caused by *Legionella*.

3. Where should I start?

Establish and / or consult with the multidisciplinary water safety group (WSG)³ or other person (s) responsible for water safety (often referred to as the Responsible Person or RP) within the organisation, using external expertise where needed. This should be done before plans are put in place to make changes to the water system such as adding temporary wards, wash hand basins, showers etc. and / or where additional equipment needs to be installed. Water systems and associated equipment should have up to date risk assessments and management plans for controlling risks from *Legionella*. Where risk assessments and management plans are not up to date, or where there are any planned alterations or installation of additional equipment, the risk assessments and proposed water management plans should be reviewed and agreed by the RP/WSG or other persons responsible for water safety. Any alterations to the management of water put in place should be documented. It is important this is done at the design and specification stage to ensure water systems and associated equipment are installed, commissioned, operated and managed safely by competent and experienced engineers following the processes agreed by the RP/WSG. Advice should be sought from appropriate competent and experienced external consultants where required. The WSG should

¹ The microbiological safety of drinking water is based on the absence of faecal indicators e.g. *E. coli*. There is no correlation between the absence of faecal indicators in drinking water and the presence of waterborne opportunistic pathogens that can colonise and grow within water systems including *Legionella* spp., *P. aeruginosa*, other Gram-negative waterborne pathogens and environmental *Mycobacteria* spp. Whilst waterborne pathogens may be present in small numbers in the supply water and often not detectable by routine methods, where conditions allow (warm water temperatures, the presence of nutrients etc.) they can grow within water systems and associated equipment to levels which may cause serious harm and sometimes death to susceptible persons.

² Where water goes down the "wrong way" when trying to drink so it enters the lungs instead of the intestinal tract

³ A Water Safety Group (WSG) is a multidisciplinary group with all the skills and competencies required to support the design, specification, build, installation, commissioning, operation, monitoring and maintenance of water systems with the relevant expertise to manage all water systems and associated equipment which store, contain or use water as part of the COVID-19 response. This group would normally be led by a Director of Infection Prevention and Control (or equivalent) and include representation from Water System Engineers, Finance, Microbiologists, Nursing Managers, Cleaning Supervisors, Maintenance, Specialist Water Advisors, Water Treatment Specialists. and where applicable those with specialist water quality requirements such as Decontamination, Renal Dialysis etc, Specialist Water Advisors, Water Treatment Specialists.



ensure there are processes in place to ensure that checks are made to ensure any external help employed is experienced and competent to carry out the required tasks.

Factors which increase the risk of waterborne infections in staff and highly susceptible patients as a result of the COVID-19 response include: -

- Difficulties in applying routine control measures, performing routine maintenance, monitoring, audit and supervision activities associated with healthcare and other public facilities due to movement restrictions, shutdowns, staff shortages due to illness or isolation and financial restraints.
- Rushed planning, specification, installation, commissioning etc. of changes to water systems or of installing equipment for COVID-19 patients, or patients moved from a hospital setting to make way for COVID-19 patients, such as additional point of use fittings, ventilators, humidification equipment, additional showers and clinical wash hand basins etc. without proper risk assessment and input from the RP/WSG and competent water safety specialists at appropriate stages where needed, etc.
- The use of temporary equipment such as mobile wash hand stations which have not been fully drained and dried before storing may be contaminated with waterborne pathogens such as *Legionella*.
- Interruption or disruption to routine water maintenance due to local isolation policies, staff shortages, illness, site closures / shutdowns or financial constraints.
- The introduction of contamination into systems and equipment for example; from pressure and leak testing of equipment fittings, components etc. by contaminated water during manufacture and failing to protect pipework, components, fittings etc. from contamination during the build and installation process.
- Reduction in testing for *Legionella* leading to under-recognition of contaminated sources, outbreaks cases and clusters especially when there are staff shortages due to illness or self-isolation.
- Increased patient and staff occupancy putting a strain on the ability to provide sufficient hot and cold water with adequate temperature recovery times.
- Increased numbers of patients requiring respiratory support and assistance with care.
- Changes in rates of room occupation.

4. Special requirements for water quality standards

Where there are special water quality standards required such as for dialysis, water used for humidification, ventilators, oxygen delivery etc., expertise should be sought from the relevant specialist suppliers. You should develop, and or modify, the water safety management plan (WSP)⁴ (this can be by annotating the existing WSP by hand or adding an addendum) and ensure all actions are agreed by the WSG. Document how you will protect patients, staff, visitors and others from the presence of waterborne pathogens including *Legionella*. If required, get help from an experienced and competent water treatment advisor, public health or environmental health authorities.

Where national guidelines or legislation is in place then you must follow these. For example, in some countries, including the UK, cold water temperatures should be < 20 °C within two minutes of turning on the outlet.

5. Key points to remember

It is important to remember that *Legionella* and other waterborne pathogens of relevance in healthcare settings will grow in water systems to levels which may cause infection where: -

- the temperature of the water >25°C and < 50 °C. This does not have to be in the entire system, just relatively small areas of the system pipework for example, at these temperatures will allow *Legionella* to grow which, can then contaminate and spread to other parts of the system and subsequently make it difficult to control their growth. It is important to prevent the hot water from cooling and the cold from warming so ensure a minimum of 55°C is maintained within one minute at all outlets in hot water systems and cold water can be delivered at ≤25 °C within 2 minutes of turning on the outlet (or the feeds into thermostatic mixing valves where these are fitted). Effective insulation of hot and cold supply pipework can help reduce heat transfer;

⁴ A Water Safety Plan (WSP) is a documented approach based on identifying all significant risks to public health from water within buildings, ensuring that effective controls and barriers are applied to minimize these risks to acceptable levels, with monitoring plans put in place to ensure the controls remain effective e.g. temperature and biocide monitoring regimes to ensure that safety is maintained. The WSP is supported by ensuring all relevant staff who may have an influence on water safety are suitably trained and there is good communication, and surveillance, including of patients so any waterborne infections would be promptly identified.



- where there is stagnation as a result of poor or no water flow.
- where materials are used which provide protective niches and nutrients for growth and biofilm formation including sludge, scale, rust, algae and other organic matter which may collect in the system pipework and calorifier particularly during periods of stagnation.
- where there is a means of creating and disseminating inhalable droplets such as the aerosols generated by evaporative air conditioning and humidification systems, operating taps, showering, flushing toilets, or when using other equipment such as humidifiers, nebulizers etc. or water which can be aspirated.
- where there are patients susceptible to aspiration⁵ and / or with compromised immune systems.
- where *Legionella*, *P. aeruginosa* and other waterborne pathogens are introduced from equipment, fittings, components and pipework which have not been adequately protected from contamination during the build and installation process or which have been commissioned or pressure / leak tested with contaminated water (the international outbreak of *Mycobacteria chimaera* infections as a result of the colonization of heart heater coolers by the manufacturer is an example of this (Hedge et al., 2017; Kohler et al., 2015; Sax et al., 2015; Walker et al., 2017).
- contamination as a result of splashing from clinical sinks and wash hand basins can contaminate outlets, patients and staff, equipment, trolleys etc. left close to the sink. Clinical sinks; wash hand basins should not therefore, be situated too close to beds (at least 1 metre away and preferably 2 metres).⁶
- where there is the potential for contamination from poor quality source water and absence of point-of-entry (POE) treatment, for example where supply quality is:
 - not from a public utility
 - not of consistent potable quality
 - intermittent or through a bowser⁷ or other supply method.

6. What to do if there are cases of Legionnaire's disease

It is important when there is a case of Legionnaire's disease associated with premises that:

- when water samples are sent to a testing laboratory, they are instructed to retain the sample concentrate and any isolates.
- any clinical isolates and lower respiratory specimens obtained from patients are retained for typing.
- both environmental and clinical isolates are referred for typing to the national reference facility as per routine country specific guidance.

7. ESGLI recommends the following to keep healthcare water systems safe:

- There is a need to maintain awareness of the risks from infections due to water, including legionellosis, during the COVID-19 pandemic.
- Local and national guidance should be in place in order to reduce such risks – key technical recommendations appear below.
- Care must be taken to ensure control measures are maintained in all water systems despite the difficult COVID-19 situation e.g. temperature, biocides (where applicable, flushing of infrequently used water outlets etc.).
- Proper risk assessment must be undertaken, especially before changes to water systems are being considered, including the performance of routine inspections.
- Healthcare professionals should remain vigilant to allow detection of legionellosis in appropriate clinical circumstances.

8. Technical Guidance

8.1. When extending or modifying existing water supplies

When changes to water systems are planned it is essential that you consult the Water Safety Group or other person(s) responsible for managing the risks from legionellosis and other waterborne pathogens. For new builds or conversions, a risk

⁵ Where liquids or food goes down the "wrong way" when swallowing so it enters the lungs instead of the intestinal tract

⁶ The risk of waterborne pathogens being spread by splashing is increased where sinks are used with drains directly below the outlet and where basins do not drain quickly.

⁷ A bowser is a mobile tank or tanker which transports and delivers potable water where there is no continuous supply.



assessment should be completed at the design and specification stage and reviewed by the WSG. Any recommendations should be addressed.

For existing buildings, the risk assessment should be reviewed by competent assessors and updated to reflect the current water system configuration, including any changes to usage, together with a review of other systems or equipment which have either been added or have reduced use or are to be shut down. Carry out any actions identified by the risk assessment review and amend the WSP as necessary.

The risk assessment should consider whether the existing infrastructure can maintain flow, pressure and temperature following any planned extension. Where a large extension is made to existing water systems, they may result in inadvertent knock on effects such as low flow, reduced hot water temperatures, elevated cold-water temperatures and difficulties in achieving target levels of biocides (where applied).

The risk assessment review should include current risk assessments, control plans and monitoring records to ensure the water system has been managed safely to date.

1. Ensure at least 0.5-1.0 mg/L free chlorine is maintained throughout the system.
2. Ensure temperatures leaving the calorifier (or stored hot water vessel) reach ≥ 60 °C, and the temperature at the outlets or the supplies to the thermostatic mixing valves reach ≥ 55 °C within one minute of turning on the tap. Return temperatures to the calorifier should be at least 55 °C on each loop of the return pipework.
3. The cold water should be below 25 °C at the outlets within two minutes of turning on the tap (taps should be run gently to avoid splashing).
4. Care should be taken to avoid exposure of patients to aerosols and splashing including from sinks and wash hand basins and by encouraging toilets lids to be closed when flushed. Clinical sinks; wash hand basins should not be situated too close to beds (at least 1 metre away and preferably 2 metres). Where the risk from waterborne infection cannot be adequately controlled the RP/WSG should consider the use of point of use filters to protect susceptible patients.
5. Waste water used for patient hygiene etc and fluids, including the remains of antibiotic infusions should not be disposed of down the sinks as these provide nutrients for pathogens to grow within the drain and can encourage the development of antibiotic-resistant bacterial communities (Edmonds et al., 1972). Suitable provision for of sinks for waste water and other fluids disposal (sluices) should be made close to the patient care areas.
6. Wet wipes used such as those used for personal hygiene should not be disposed of down toilets or waste water disposal sinks (sluices) as these block the waste water system posing a risk of backflow into the drinking water.

8.2. Other systems

Check what other systems are on site which could pose a risk of Legionnaires' disease such as evaporative cooling towers, whirlpool baths etc. Ensure that they are managed safely and maintain the normal management regime as documented within the WSP. Where there are changes to use or the systems in place to control risks please ensure the risk assessment is reviewed by someone experienced and competent to do so. there is useful advice for evaporative cooling and other systems within: <https://www.ecdc.europa.eu/sites/portal/files/documents/Legionella%20GuidelinesFinal%20updated%20for%20ECDC%20corrections.pdf>

9. References

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Please note

Whilst every effort has been made to ensure the accuracy of the material contained in this publication, all water systems are individual in nature as a result of their design, materials and usage. The authors do not accept any responsibility whatsoever for loss or damage



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These guidelines have been developed by experts from the ESCMID Study Group for Legionella Infections

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If you notice any mistakes in these guidelines or have suggestions for improving them, please address them to susannelee@leegionella.co.uk

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