Looking deeper

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Inside this issue

Times are changing...

Looking Deeper Editor, **Susan Pearson**

If 2020 was the year of Covid, 2021 may well prove to be the year of change — or perhaps the year when we integrate and consolidate changes triggered by the pandemic. In our last issue we looked at some of the unintended consequences of the Covid-19 pandemic — and in this issue we pick up on some of the many changes that could become fixed features in healthcare water safety management.

This issue's front cover has been chosen to reflect one of the major changes in all professional spheres — remote meetings hosted via video conferencing. Although this has at first felt like an alien form of communication for many, most of us have got used to it — and importantly have seen how it can confer certain advantages.

This has certainly applied to water management and infection control. Not only have remote meetings been essential in ensuring that water safety groups (WSGs) have continued to function, for Trusts that are spread out over a large campus or based across multiple sites, meeting remotely has often made it easier for representatives from a wider range of departments and specialities to attend.

"Times change, and we change with them"
William Harrison
(Description of Britain, 1577)*

WSGs are multidisciplinary groups that should ideally encompass as wide a range of skills and competencies as possible, as highlighted in our article on the remit of WSGs (p 10-11), but they also have a function in passing on expertise and learning across all departments. A good example of this is the specialist knowledge that can be accessed by maternity departments to prevent the potential, although rare, microbiological risks during water births. These are outlined on pages 9-10, although it should be stressed that neonatal infections are no more likely to happen in water than in bed births.

Another inevitable impact of the pandemic will be a change in how we view the design of washrooms: although the need for social distancing should lessen, a greater need for distance will be a consideration in washroom blueprints of the future.

On pages 6-8, independent water hygiene and safety engineer Mike Quest takes us through some of the ways that toilet facilities of the future may develop. Are they likely to become more spacious, eliminating the need to separate hand wash basins, urinals or toilet cubicles by blocking them off, potentially leading to water stagnation and undesirable microbiological growth? Or will single units, maybe self-cleaning, become 'the norm', each with their own basin, touch-free taps, toilet and dryer?

**Translated from Latin, attributed to Frankish Emperor Lothar 1st.*

Contents

Editorial Contributions

Susan is an independent journalist and communications specialist with a background in biology, medical research and publishing. She has been writing on medical issues for over 30 years and on waterborne infection and water management since 2010. She has been a frequent contributor to IHEEM's Health Estate Journal, WMSoc's Waterline and the Clinical Services Journal.

Susan Pearson

Elise is an independent consultant to the water and medical devices industries and a former Chair of the Water Management Society (WMSoc). She is a state-registered microbiologist, a BSI committee member and was on the steering group for Department of Health HTM 04-01: Safe water in healthcare premises. Elise is a Fellow of WMSoc, IBMS, IHEEM and also of the Royal Society of Public Health (RSPH), where she is an active member of the water special interest group. She chairs and presents at numerous international conferences.

Elise Maynard

Mike is an independent water hygiene and safety NHS Authorising Engineer (AE) and consultant with 20 years' experience in the *Legionella* and water management industry. Mike is one of the *Legionella* Control Association LCA's auditors and a member of the Water Management Society's Training Committee. His positions as AE (water) include Bristol University Hospital, Southampton General Hospital and the Royal United Hospital Bath NHS Trusts, as well as the States of Guernsey Health and Social Care and Nuffield Health. Mike delivers water related training for Eastwood Park in Gloucestershire, the Water Management Society and for his own company Peninsula Water Hygiene Ltd.

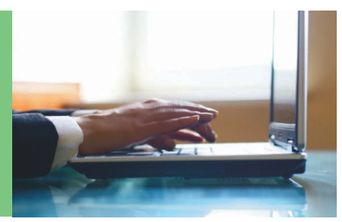
Mike Quest

Jimmy worked for Public Health England (PHE) as a scientific leader in water microbiology and decontamination, and managed a range of research projects on biofilms and pathogens such as *Legionella* spp., *Pseudomonas aeruginosa* and *Mycobacteria spp*. Through PHE he worked with the Department of Health (DH England) and the Health and Safety Executive in writing and developing national and international guidance on the microbiology of water and decontamination in healthcare and has been involved in writing COVID-19 guidance. Jimmy's extensive publication record includes his recently edited book "Decontamination in Hospitals and Healthcare". Jimmy is currently a microbiological consultant through "Walker on Water".

Dr Jimmy Walker

Share your thoughts with us in the next issue

We would really value your reactions to this latest issue of Looking Deeper. We'd like to hear from you about what you liked, what you feel could be improved on and what topics you want to see discussed. You can contact us at **editorial@lookingdeeper.co.uk**



In the news...

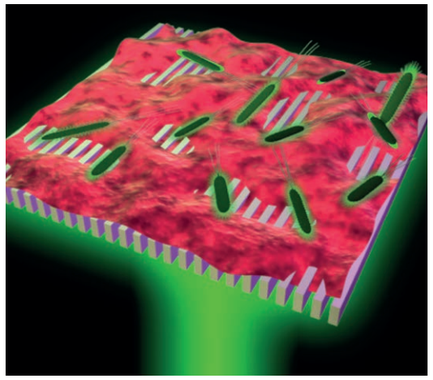
Multi-spectral imaging probes biofilm antibiotic resistance

A new technique to monitor the formation of biofilms and their responses to antibiotics has been developed through a collaboration between physicists and biologists at the University of York and clinicians at the York Teaching Hospital.

Build-up of biofilms, 'film-like' colonies of microorganisms such as bacteria, are a major source of hard-to-treat recurring infections in the bladder or urinary tract. Compared to existing and often destructive protocols, this technique offers a method to assess when a biofilm has been affected by an antibiotic — offering greater insight into the antimicrobial resistance of biofilms and potential development as a tool for deciding which antibiotic to use to treat the infection.

The new method uses resonant hyperspectral imaging and is the first time scientists have been able to remotely monitor the very early stages of *E.coli* cell attachment, micro-colony and biofilm formation, *in situ* and in real-time, without any expensive or complicated microscopic instruments.

Dr Yue Wang from the Department of Physics and the project's principal investigator says: "[This] is a real break-through...We hope it will soon provide a handheld tool for clinicians treating biofilm infections."



Credit: Dr Kezheng Li and Dr Christopher Reardon

Major research grant to study silver effect on water disinfection

A cross-disciplinary research team at the University of Pittsburgh in the US has been awarded a major $330,000 grant to examine the effect that silver embedded in shower fixtures has on water disinfection.

While water entering buildings has been treated and contains residual disinfectant, such as chlorine, it is not sterile and still contains many bacteria, which are not generally harmful. However, changes in water chemistry — particularly stagnation, as observed during the Covid-19 pandemic — can have unforeseen consequences for water quality, with periods of stagnation creating ideal conditions for microbial growth of organisms such as *Legionella pneumophila*, which causes the respiratory Legionnaires' disease. Turning on taps, showers or flushing toilets creates aerosols that could potentially be contaminated with pathogenic bugs, posing a public health risk.

According to Leanne Gilbertson, assistant professor of civil and environmental engineering (CEE) at Pitt's Swanson School of Engineering and lead researcher on the study: "Water fixtures containing silver are believed to eliminate bacteria due to the antimicrobial properties of this heavy metal. However, heavy metal exposure is also known to transform some bacteria into antibiotic resistant forms."

Jill Millstone, associate professor of chemistry at Pitt explained: "Many aspects of both the water composition and water fixtures can influence how much and how fast silver interacts with bacteria....We'll work to quantify these factors and make connections between the presence of OPs [opportunistic pathogens] and the amount, type, and rate of silver release. Uncovering these relationships should lead to more effective fixture design that maximises antimicrobial activity and minimises resistance build-up."

CBD offers hope in AMR fight

Synthetic cannabidiol, commonly known as CBD, could offer a major breakthrough in developing one of the first new classes of antibiotics in 60 years.

A research collaboration between The University of Queensland and Botanix Pharmaceuticals Limited has shown for the first time that CBD, the main non-psychoactive component of cannabis, kills Gram-negative bacteria such as those responsible for Legionnaires' disease, gonorrhoea and meningitis, which have an extra outer membrane that is harder for antibiotics to penetrate.

The study also found CBD to be widely effective against a greater range of Gram-positive bacteria than was previously recognised, including antibiotic-resistant pathogens such as MRSA.

Mark Blaskovich, Associate Professor of the Institute for Molecular Bioscience at the University of Queensland noted that cannabidiol is particularly good at breaking down biofilms, the slimy build-up of bacteria that help pathogenic bacteria to survive antibiotic medications.

The team at the Centre for Superbug Solutions used a laboratory model mimicking a two-week patient treatment to see how fast the bacteria mutated to survive CBD treatment.

Dr Blaskovich explained: "Cannabidiol showed a low tendency to cause resistance in bacteria even when we sped up potential development by increasing concentrations of the antibiotic during 'treatment'. We think that cannabidiol kills bacteria by bursting their outer cell membranes, but we don't know yet exactly how it does that, and need to do further research."

The research team also discovered that chemical analogs, created by slightly changing CBD's molecular structure, were also active against the bacteria.

Dr Blaskovich said that the collaboration with Botanix has accelerated the research, with Botanix contributing formulation expertise.

Latest Research

Am J Infect Control.

2021 Feb 22:S0196-6553(21)00091-2. doi: 10.1016/j.ajic.2021.02.013. Epub ahead of print. PMID: 33631307.

Hospital-acquired *Legionella* Pneumonia Outbreak at an Academic Medical Center: Lessons Learned.

Kessler MA *et al.*

Background: An outbreak of *Legionella* pneumonia occurred at a university hospital using copper-silver ionization for potable water disinfection. We present the epidemiological and laboratory investigation of the outbreak, and associated case-control study.

Methods: Cases were defined by syndrome compatible with *Legionella* pneumonia with laboratory-confirmed *Legionella* infection. The water circuit and disinfection system were assessed and water samples collected for *Legionella* culture. Whole genome multi-locus sequence typing (wgMLST) was used to compare the genetic similarity of patient and environmental isolates. A case-control study was conducted to identify risk factors for *Legionella* pneumonia.

Results: We identified 13 cases of hospital-acquired *Legionella*. wgMLST revealed >99.9% shared allele content among strains isolated from clinical and water samples. Smoking ($p = 0.008$), steroid use ($p = 0.007$), and documented shower during hospitalization ($p = 0.03$) were risk factors for *Legionella* pneumonia on multivariable analysis. Environmental assessment identified modifications to the hospital water system had occurred in the month preceding the outbreak. Multiple mitigation efforts and application of point of use water filters stopped the outbreak.

Conclusions: Potable water system *Legionella* colonization occurs despite existing copper-silver ionization systems, particularly after structural disruptions. Multidisciplinary collaboration and direct monitoring for *Legionella* are important for outbreak prevention. Showering is a modifiable risk factor for nosocomial *Legionella* pneumonia. Shower restriction and point-of-use filters merit consideration during an outbreak.

Image courtesy of SmithGroup

BACK TO THE FUTURE?

WASHROOM DESIGN FOR THE 2020s AND BEYOND

When automatic self-cleaning individual toilets, 'Sanisettes', first appeared on the streets of Paris in 1980 they were regarded as a space-age answer to public facilities, but were viewed more cautiously in the UK, where they never really took off as they did elsewhere in Europe. Since then, this 80's answer to hygienic public conveniences has evolved into futuristic sleek silver AmeniTREES capsules due soon to grace some of San Francisco's streets.

The challenges of the Covid-19 epidemic, which we looked at in some detail in our last issue (8), combined with our ever increasing understanding of the part water plays in transmitting infections in different bathroom settings, will need to be reflected in how the next and future generations of washrooms are designed. Could this shiny sci-fi technology from the US Western seaboard have a part to play in solving the requirements of washrooms of the future?

We asked independent water hygiene and safety engineer Mike Quest to explore the main issues and potential solutions in designing washrooms that might answer both current and future safety requirements.

Initial thoughts

Toilet facilities play an important role in public buildings. Not only must they be genuinely clean and 'safe', but must also appear hygienic to their users, as amenities that appear unsanitary reflect badly on the organisation that houses them. Building owners want their facilities to be safe, but at the same time they must look and smell pleasant to use.

The Covid-19 pandemic has led to a public washroom trend of taped off urinals and hand wash basins (HWBs) to facilitate 'social distancing'. This is not only messy, with yards of unsightly yellow tape, but is an unsustainable solution in the long term: unused outlets lead to unintended water stagnation, which facilitates bacterial colonisation and the scope for waterborne disease.

Some of the key issues in considering new and future priorities for washroom design will need to take into account social distancing, new ways buildings might be used, changes in attitudes to hand-washing as Covid becomes less prevalent, and whether a typical washroom will trend towards self-contained cubicles, or 'super loos', with a toilet, basin and dryer. There is likely to be a greater priority towards touch-free sensor taps and a much greater emphasis on ventilation.

As more people have been working from home, their domestic water bills have increased — but conversely, usage has reduced significantly in large public buildings. Commercial and civic organisations are likely to want to hang on to this financial saving, which will also appear more 'sustainable' in terms of water consumption. However, this focus on water sustainability has a downside because installation of water saving devices may lead to undesirable water stagnation — a consequence of water saving that has become a recognised sustainability conundrum in healthcare facilities.

Design and layout

Risk assessments for *Legionella*, the bacteria that causes Legionnaires' disease, have identified stagnation in water systems associated with taps, urinals and toilet cubicles that have been taped off, effectively creating plumbing 'dead legs' that will inevitably lead to bacterial colonisation.

Mike notes that flushing often fails to address this problem as flushing regimes often 'forget' to assess these outlets as 'little used water points'. Auto flushing devices can be an option if used on every single outlet, but this wastes water.

Rotation of outlet use is often the best method of control and can be left to users' natural instincts to maintain social distance. Even in 'normal times' people tend to avoid each other so that each basin or urinal naturally gets its turn to be used.

Placing barriers that can be swapped between outlets would also be likely to interfere with this 'natural' rotation

and the 'barriers' would need to be moved too frequently to be effective at preventing stagnation.

Separating urinals with Perspex screens, as has been done in some motorway service stations, is a possible solution. However, the screens would need very regular, very robust cleaning.

Since the Covid pandemic has inevitably changed the way we think about washroom use and the need for social distancing may have to continue, perhaps a constructive approach to washroom design will be to introduce much more space, both between urinals and HWBs and in the overall pathways through toilet amenities.

"Rotation of outlet use is often the best method of control and can be left to users' natural instincts."
Mike Quest

Behaviour

The pandemic has made younger generations more aware of cross-contamination risks and the need for good ventilation — it seems probable that their changes in behaviour are more likely to 'stick' and that should be reflected in requirements for washroom design.

In particular, behaviour in men's urinals is likely to alter in favour of more hand washing. Past statistics indicate that previously, many people have not washed their hands after using a toilet. Will this now improve, or remain the same when a private self-contained facility is used? Units in some public toilets issue soap, (warm) water and a drying facility, which fulfils the criteria that states at least 20 seconds should be spent washing hands to be effective for removing pathogenic microorganisms.

However, encouragement for hand washing could also be prompted automatically — rather like 'sat nav' voices in cars, could toilets issue electronic reminders to "now wash your hands"?

Ventilation

Good ventilation is a hugely important factor in preventing Covid-19 transmission, but is often missed as a crucial control measure. There is considerable scope for wider education on this.

HSE guidance: Ventilation and air conditioning during the coronavirus (COVID-19) pandemic

"The law requires employers to ensure an adequate supply of fresh air in the workplace and this has not changed during the pandemic.

Good ventilation, together with social distancing, keeping your workplace clean and frequent handwashing, can help reduce the risk of spreading coronavirus.

This guidance will help you identify poorly ventilated areas of your workplace and provides steps you can take to improve ventilation. It will apply in most workplaces."[1]

In fact, there are Health Safety Executive (HSE) requirements for ventilation in a wide range of locations (see above). Hospitals also have specifications for air turnover in relation to infection control,[2] but these may need to be re-examined in the context of Covid transmission.

Products

What types of products could enhance washroom design and provide solutions to the issues discussed above?

Taps

Sensor taps

- Non-touch sensor taps may contain components that can be vulnerable to microbial growth. Some options, however, can be programmed to auto-flush.
- Sensor taps are a good choice for public washrooms as they minimise hand contact.

Elbow-operated taps

In certain clinical settings, such as scrub sinks and augmented care areas, these may be a better option than sensor taps.

Foot operated taps

Another option for clinical settings in particular. For example, these have been used for temporary wash stations in the mass vaccination centre at Bath Racecourse.

Automatic flushing systems

May prevent stagnation where outlets are likely to be little used, such as the end of a pipe-run.

Anti-microbial surfaces

A number of HWBs are available with anti-microbial glazes, usually containing silver.

However, these surfaces do not provide an 'instant kill'. Rather, they are inhibitory towards bacterial growth, but need some time to work, making them more effective for low use basins. It is important that cleaners are educated regarding their role in maintaining water hygiene and that they follow method statements such as those demonstrated by the RSPH hygiene protocol for cleaning taps and sinks.[3]

Toilets

Research shows that the SARS-CoV-2 virus (which is the causative agent of Covid-19) is present in the faeces of infected individuals and has been found in waste water.[4] This has implications for toilet design as many toilets produce aerosols when flushed (see Issue 7, p 15), an effect implicated in potentially spreading not just the Covid virus, but any other contaminating waterborne pathogens.

Some models of toilets produce fewer aerosols than others, while other designs are easier to clean. New designs will need to find a balance between the two requirements.

One solution is the toilet that can only be flushed when the lid is closed, as has already appeared in some motorway service stations. In healthcare, however, toilet lids are prohibited and they can be difficult to manage for wheelchair users, while in mental health facilities (and maybe prisons), toilet lids are eschewed because they could be used as an instrument for self-harm or even as a weapon.

Another solution to the aerosol problem could be suction or vacuum emptying as is used in aeroplane toilets. This again might not be suitable for mental health patients for whom loud noises may be too challenging — however, there are newer models of vacuum-type toilets found 'on land' that are much quieter.

Aquablade flush technology reduces the aerosol effect when flushed

References

1. Heating and ventilation systems Health Technical Memorandum 03-01: Specialised ventilation for healthcare premises: www.gov.uk/government/publications/guidance-on-specialised-ventilation-for-healthcare-premises-parts-a-and-b
2. www.hse.gov.uk/coronavirus/equipment-and-machinery/air-conditioning-and-ventilation.htm?utm_source=govdelivery&utm_medium=email&utm_campaign=coronavirus&utm_term=ventilation-headline&utm_content=covid-4-feb-21
3. www.youtube.com/watch?v=Wc-RgwIJpdY
4. Hai Nguyen Tran *et al* "SARS-CoV-2 coronavirus in water and wastewater: A critical review about presence and concern", *J Environ Res* **193**:110265, 2021. pubmed.ncbi.nlm.nih.gov/33011225/].

Additional reading

https://www.hse.gov.uk/coronavirus/science-research.htm?utm_source=govdelivery&utm_medium=email&utm_campaign=coronavirus&utm_term=science-headline&utm_content=covid-4-feb-21

https://www.hse.gov.uk/coronavirus/index.htm?utm_source=govdelivery&utm_medium=email&utm_campaign=coronavirus&utm_term=covid-updates-headline&utm_content=covid-4-feb-21

Pool rules explained

Water births are largely considered safe — but are there potential microbiological risks? And what are the best recommendations to eliminate any possible dangers? Dr Jimmy Walker clarifies some of the advice outlined in an upcoming 'back to basics' book* aimed at training and education on the potential microbiological risks from water in healthcare facilities.

Water births have long been considered a safe way of giving birth for women who are not expected to have complex deliveries, with the literature backing up this record to show that rates of neonatal infections are no greater in water births than conventional bed births.[1,2,3,4] However, this doesn't mean there are no risks at all. Rare instances of adverse events have occurred, including microbial neonatal infections caused by a range of organisms that have included *Legionella*, the cause of Legionnaires' disease, and *Pseudomonas aeruginosa* — although these have largely been related to home births.

There are several routes for potential contamination of water during a water birth:

Water supply

If either of the above organisms were found in a pool, this would indicate either contamination in the water system or at the tap outlet. If only a tap outlet were colonised, the contamination may be diluted to negligible levels in the pool once that tap is run. However, running a tap when there is biofilm build-up, either in the last two metres or further back in the system, would continue to release microorganisms leading to microbial concentrations in the pool water that could lead to infections.

This is a highly unlikely scenario that would only occur if water maintenance has been neglected enough to allow conditions for microbial growth to develop: for example where pipes have not been lagged properly causing the hot water to become cooler and the cold pipe to become warmer, creating ideal temperatures to enable growth of *Legionella* bacteria, for example.

Bodily fluids, birthing 'debris' and maternal contamination

As part of the birth process, water in birthing pools will inevitably be contaminated by bodily fluids and 'debris', such as placenta, some of which will be caught in strainers. Pool water can also be contaminated by faecal matter and any *P. aeruginosa* the mother may be carrying (*P. aeruginosa* can occur naturally on the skin of healthy individuals), although newborns are unlikely to be at risk from maternal 'flora'. A clear protocol is essential for drainage of the pool, cleaning and also disinfection to remove this contamination. All accessories must also be cleaned and thoroughly disinfected — or be single use.

If contamination is not properly dealt with, then any remaining residues will encourage microbial growth that could lead to potentially dangerous contamination of the next user's water.

Drains

The role of drains as a source of healthcare associated infections (HAIs) and potential reservoirs of antibiotic resistant organisms is now being regularly documented, with carbapenem-resistant Enterobacteriaceae (CREs) a particular concern.

Single use plugs and strainers are now most commonly used, with a large access valve for nurses and midwives to retain water in the bath. However, because birthing pools are usually located at floor level, the gradient of the drainage pipework may not be sufficient to remove the material caught in the drain. Although such an event has not yet been reported, this creates the potential for biofilmbuild-up over time, to a level that may be difficult for disinfectants to penetrate and possible contamination of the pool as soon as it is filled.

Birthing pool design

Birthing pools could be improved to prevent this backflow scenario from the drain, with designs that ensure efficient drainage of contaminating material and valves and drains that are easy to disinfect.

There are also examples of birthing pools where the pool is filled via a wall tap that enters the pool at a level where the water could flow back into the tap. This again has the potential for back contamination of the tap, with bacterial colonisation reaching even further back into the system in contravention of the water fitting directive. Birthing pools

should be designed with taps that are well above the pool's edge and which are fitted with suitable backflow protection.

Some birthing pools also have an associated showerhead for cleaning the pool after use. However, this is also inadvisable as the flexible hose and shower head may become contaminated when they are suspended in the water. This could not only lead to backflow and contamination of the supply, but also, the contaminated hose and shower head could introduce harmful bacteria to the pool if they are not cleaned and disinfected appropriately or replaced between uses.

In addition, because water births are not always considered appropriate, there may be a prolonged period when the pool is not used. Where this is the case, a flushing regime is essential to minimise water stagnation, biofilm build-up and microbial proliferation in the water supply.

Resolving issues

Maternity units are well aware of the risks and must carry out their own risk assessments, but it is important that they are assisted in this by appropriate members of the hospitals' water safety groups (WSGs – see p 10-12), who can provide additional specialist knowledge e.g. from microbiologists and the estates team.

Health Building Note 09-02 provides regulations and recommendations for birthing pools.

References

1. Thoeni, A. *et al* "Review of 1600 water births. Does water birth increase the risk of neonatal infection?" *J Matern Fetal Neonatal Med* **17**: 357–361, 2005. "https://doi.org/10.1080/14767050500140388"doi.org/10.1080/14767050500140388
2. Neiman, E. *et al* "Outcomes of water birth in a US hospital-based midwifery practice: A retrospective cohort study of water immersion during labour and birth", *J Midwifery Womens Health* **65**:216–223, 2020. "https://doi.org/10.1111/jmwh.13033"/doi.org/10.1111/jmwh.13033
3. Bovbjerg, M.L., Cheyney, M., Everson, C. "Maternal and newborn outcomes following waterbirth: The midwives alliance of North America statistics project, 2004 to 2009 Cohort, *J Midwifery Womens Health* **61**:11–20, 2016. "https://doi.org/10.1111/jmwh.12394"doi.org/10.1111/jmwh.12394
4. Taylor, H. *et al* "Neonatal outcomes of water birth: a systematic review and meta-analysis. *Arch Dis Child Fetal Neonatal* **101**(4):357-365, 2016. doi.org/10.1136/archdischild-2015-309600

**Dr Walker is co-authoring "Safe Water in Healthcare" with Dr Michael Weinbren, Dr Paul McDermott and Dr Susanne Lee. To be published by Elsevier in 2022, the new book will cover safe water in healthcare facilities and will describe all aspects of microbial risks associated with hot and cold water systems including, showers, HWBs, laundries, endoscopy and drains.*

Water Safety Groups and Water Safety Plans — how do they apply in practice?

By Elise Maynard

The World Health Organisation (WHO) publications "Water Safety in Buildings"[1] and "Guidelines for Drinking Water Quality"[2] give guidance on how to ensure that water used within the built environment is safe for all uses and users. These publications advocate the water safety plan (WSP) approach in the development of a comprehensive strategy to ensure water is safe for all types of use, from the initial design of a building water system and associated equipment, through its entire lifecycle.

Water safety plans

A WSP should be a proactive strategic plan that defines and documents the processes required for safe use and management of all water systems. It should also be bespoke to any given system in order to accommodate the different types and complexities of water systems and related equipment and to take into account the size and type of the business or organisation. This is applicable to all organisations, not just to healthcare.

WSPs need to take account of all potential hazards, including those of a biological (and microbiological), chemical, physical and radiological nature. Risk assessments should be performed to identify physical hazards, such as scalding and where users may be more susceptible to certain infections.

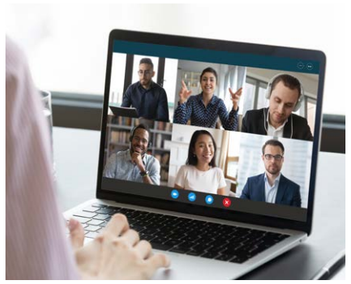
It is really important that the WSP is not a large, unwieldy document, but a high-level strategic plan that sets out the way the organisation manages all risks from water and meets all applicable legislation, guidance and standards. The complexity of this will vary according to the complexity of the site, but should, nevertheless, be a 'living' document that can be easily managed. It should clearly define the legal responsibilities for water safety and the processes for ensuring all stakeholders are aware of their individual responsibilities for controlling any potential risks to health derived from water on site.

The WSP should also include processes for ensuring all those involved have sufficient information, instruction and training to understand the impact of both good and poor design, build, commissioning, operation and management on water system safety, which is specific to the type and range of systems and equipment to be incorporated in the building. The roles, accountabilities and responsibilities should be clear in cross-functional/departmental projects and processes. Further detail should identify processes to ensure safe design, installation, commissioning, operation, management and maintenance. In addition, supporting programmes should be in place for staff training and competence, surveillance, supervision, audit, records, communication, continual review etc.

Water safety groups

In order to develop a comprehensive WSP a water safety group (WSG) needs to be created with responsibility for developing and implementing the WSP.

Ideally the WSG should comprise a multidisciplinary group of people with the skills and responsibility for ensuring that the water is safe at the point of use for all uses and all users of water within the building(s) identified in the WSP. For a small site, this could comprise the Health and Safety representative, the person responsible for water maintenance and/or cleaning and a member of staff that uses water, for example.



Multidisciplinary water safety groups are now meeting remotely

For larger sites, the lines of accountability and communication up to top level management by the WSG should be clear and enable regular reporting and review of water risk management.

The WSG remit, allocation of responsibilities and reporting structure should be agreed with the duty holder, and the WSG members should:

- be empowered to manage water safety throughout the whole lifecycle
- have the range of skills and competencies needed to manage water safety under a variety of operating conditions; and
- have the resources necessary to carry out their role effectively.

Where the necessary skills and competencies are not available in house, external specialist advisers, contractors and service providers should be considered following careful competency review by the WSG.

The WSG should ensure there is an initial high-level assessment of what is already in place to identify any gaps in the existing water safety governance and management measures, and any need for amendment or development i.e. a gap analysis. For premises that have good management of *Legionella* risks, according to

Sculpture fountain at St Thomas's Hospital, London

the 'Approved Code of Practice' (ACoP) and associated guidance for 'Legionnaires' disease - the control of *Legionella* bacteria in water systems',[3] a lot of the microbiological components of the WSP should already be in place as *Legionella* control measures include many elements of good water hygiene maintenance. The gap analysis should, however, also identify potential risks from scalding, slips/trips, falls, drowning, electrocution, pressurised water systems etc. and an assessment of the current management of all water including wells, ponds, engineered water systems and any associated equipment.

BS 8680:2020

BS 8680:2020 'Water quality — Water safety plans — Code of practice'[4] has a vast amount of useful detail about how to set up WSGs and WSPs, with charts and checklists that can assist in both setting up a new WSG and WSP, but also to aid existing ones (infographic available[5]). The standard was developed specifically with key design considerations and contains a number of useful annexes:

Annex A provides an example framework for allocating many of the activities to different members of a project or building management team with reference to the relevant clauses of this standard and is intended to be used as an aide-memoire for activities and development of a WSP.

Annex C (Design, specification and commissioning) requires that all water systems, attached equipment, fittings, components and equipment should be specified and designed so that they do not introduce inherent risks, i.e. allow introduction or increase hazards to levels that can cause harm to those exposed. They should be as easily accessible as possible and with sufficient space for cleaning and maintenance. For a new building, upgrade or refurbishment of an existing water system, each step from

the concept and design stage of the project, through to full occupation and normal operation of all water systems, should be fully risk assessed to ensure all potential risks of harm arising from all water on site are controlled and minimised at each stage of the project. Therefore, at completion and handover, each system should have been designed, specified, constructed, installed, commissioned and operated to minimise risks from all potential hazards and hazardous events.

This annex covers specific detail for the following:

- Source water quality
- Responsibilities and training
- Ground contamination
- Design
- Alterations and refurbishments
- Risk factors to be considered at the design stage such as temperature and nutrient ingress
- Materials and fittings
- Healthcare design and specification considerations
- Specification
- Project risk assessments
- Construction and installation
- Commissioning
- Handover.

Annex D contains an example of a WSP checklist for new builds.

Some projects may require the appointment of a new multidisciplinary WSG with the skills and competency required to review and approve the design brief.

References

1. WHO Water Safety in Buildings 2011 www.who.int/water_sanitation_health/publications/2011/9789241548106/en/
2. WHO Guidelines for Drinking Water Quality 2017 www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health/water-safety-and-quality/drinking-water-quality-guidelines
3. Legionnaires' disease. The control of *Legionella* bacteria in water systems Approved Code of Practice and guidance, 2013.
4. BS 8680:2020 Water quality — Water safety plans — Code of practice. shop.bsigroup.com/ProductDetail?pid=000000000030364472
5. bsigroup.com/en-GB/blog/Environmental-Blog/what-you-need-to-know-about-our-new-british-standard-on-water-safety-planning-for-buildings/bs-8680---wsp-form/

Dates for diaries...

World Microbe Forum
20-24/06/2021 Online
worldmicrobeforum.org/index.html

Don't panic: Healthcare Infection Society
22/06/2021 Online
his.org.uk/training-events/dont-panic/dont-panic-2021/

31st European Congress of Clinical Microbiology & Infectious Diseases (ESCMID);
9-12/07/2021 Vienna, Austria
escmid.org/

18th International Biodeterioration & Biodegradation Symposium - IBBS 18
7-10/09/2021 Montana, USA
ibbsonline.org/meetings/

GOSH Environment Network Meeting
14/09/2021 London
wmsoc.org.uk/news/545/

Water Management Society Conference
23/09/2021 Manchester, UK
wmsoc.org.uk/conferences.php