

Article

Evaluation of Water Safety Plan Compliance in Italian Hospitals According to Legislative Decree 18/23 and Directive EU 2020/2184: A Cross-Sectional Study

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Abstract

In 2020, Directive (EU) 2020/2184 was published and subsequently transposed into Italian legislation via Legislative Decree 18/23 (Lgs.D. 18/23). The Directive aims to protect public health through a proactive approach based on a site-specific risk analysis along the entire water supply chain (Water Safety Plan, WSP). Between February and November 2024, a survey was conducted in Italy to assess both hospitals' knowledge of Lgs.D. 18/23 and the application of the WSP in these facilities. A total of 300 hospitals were asked to complete an anonymous questionnaire containing 60 questions about the characteristics of the facility and the management of the water network, including the chemical–physical and microbiological monitoring of *Legionella* and other microbiological parameters. A total of 102 questionnaires were sent out (response rate: 34%), but only 72 were properly completed and analyzed. The results of the chemical–physical monitoring are not presented in this manuscript. Overall, 52.8% of the hospitals were built before 2000, and most are aware of Directive (EU) 2020/2184, Lgs.D.18/23 (80.6%), in particular, Article 9 on the risk assessment and management of internal water systems and the guidelines for its implementation (77.8%). All hospitals perform annual microbiological water testing, including *Legionella* analysis, with a detection rate of <50%. National guidelines for the implementation of WSPs are known in 75% of the hospitals, but only 38.9% have started planning to implement them, and 13.9% organize staff training on the subject. The questionnaire responses highlight the need to train hospital staff in water system risk management and WSP planning, which will be mandatory by 2029.

Keywords: healthcare facilities; directive (EU) 2020/2184; water safety plan; microbiological monitoring; *Legionella*



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1. Introduction

The traditional approach to verifying the microbiological safety of drinking water is based on analyzing the finished product at the point where the water is made available to the consumer. Requirements and threshold values for chemical and microbiological parameters have been introduced by international coordinating and health policy bodies and transposed through European directives and national regulations. However, for more than 20 years, the effectiveness of this approach has been questioned. Indeed, epidemiological studies have shown that some of the microbiological standards used for decades to guarantee safe water quality may have limited predictive value for public health [1].

In fact, waterborne outbreaks can occur even when the levels of the reference parameters (e.g., coliforms, *Escherichia coli*) comply with the specified limits. This evidence has led to the development of a more effective preventive model to ensure the quality of the water supplied and the protection of consumer health over time, through integrated control measures extended to the entire drinking water supply chain [2]. The proposed approach, which modifies and develops the control criteria for water intended for human consumption, has been reinforced and extended by Directive (EU) 2020/2184, adopted by the European Parliament and the Council of the European Union on 16 December 2020 [3]. The core of the Directive is the proactive, holistic risk-based approach to water safety based on the Water Safety Plan (WSP) model introduced by the World Health Organization in 2004 [2].

The risk assessment and management model introduced by the WSP provides clear and practical criteria, methods, and procedures that are essential for conducting complete risk assessments. It represents a key step in ensuring water quality to protect human health.

According to the recommendations of the WHO [4], Directive (EU) 2020/2184 provides for the adoption of a water safety approach based on the assessment and management of potential risks associated with domestic water distribution systems in both public and private buildings and premises. The criteria and provisions of Directive (EU) 2020/2184 have been transposed into Italian Legislative Decree No. 18 of 23 February 2023 (henceforth Lgs.D. 18/23) [5], which entered into force on 21 March 2023. This Decree defines priority buildings (i.e., hospitals, healthcare facilities, schools) and outlines the necessary preventive, corrective, and risk-proportionate measures to restore water quality when a risk is identified.

The WHO emphasizes that the management of water distribution systems has not received sufficient attention so far in terms of health prevention, despite evidence that poor management can lead to hazardous conditions and pose a health risk to consumers. In addition, the lack of adequate training for managers, administrators, and technicians in the sector, combined with a limited multidisciplinary perspective and the absence of a systemic framework for interventions in water systems, results in inefficient operations in terms of costs and benefits.

It is well known that waterborne diseases are a major public health challenge worldwide [6]. The transmission of these diseases is closely linked to poor hygiene practices, water quality, and water management systems. Pathogenic and opportunistic microorganisms of environmental origin (e.g., *Legionella* spp., *P. aeruginosa*, non-tuberculous mycobacteria, amoebae) can be present in water and aerosols emitted from taps, showers, appliances, or water cooling systems, finding an ideal habitat in anthropogenic water systems [7,8].

The lack of adequate drinking water treatment and distribution infrastructure is a key factor in the spread of waterborne diseases [9], especially in hospitals where immunocompromised and vulnerable patients are present [10]. As the water supply can become a critical microbial reservoir and pose a health risk to both patients and healthcare workers [7], in some circumstances, the WSP may provide control measures and water quality

standards tailored to the specific water systems that are more stringent than those required by legislation.

In 2022, the National Institute of Health (Rome, Italy), in collaboration with the Italian Ministry of Health and some Italian universities, developed the “Guidelines for the assessment and management of water safety risks in internal distribution systems of priority and non-priority buildings and in certain ships, pursuant to Directive (EU) 2020/2184” (henceforth *Rapporti ISTISAN 22/32*) [11] and the “Italian Guidelines for the implementation of the Water Safety Plan” (henceforth *Rapporti ISTISAN 22/33*) [12]. These guidelines pay particular attention to healthcare facilities, where microbiological risks are associated with water distribution system colonization by microorganisms due to the presence of biofilms and specific living conditions [13–15]. They facilitate the assessment, identification, and control of potential microbiological and chemical risk sources, as well as the development of inspection programs or analytical controls for specific parameters to be monitored in internal distribution waters, such as *Legionella* and lead, as minimum parameters, according to Article 9 of the Decree. They also support the implementation of the WSP in Italy to ensure the process is adequate for collective health prevention, sustainable for water management systems, and harmonized and controlled throughout the country, extending the application of risk analysis to the entire drinking water supply.

In line with WHO recommendations [4], Legislative Decree 18/23 mandates the implementation of Water Safety Plan (WSP) principles for Class A priority facilities, classified as “health, social, and hospital care facilities.” Specifically, all healthcare facilities in this category will have to implement a WSP by 2029.

Despite the growing recognition of this risk-based approach to safeguarding drinking water, there is limited literature documenting WSP implementation in hospitals within high-income countries. In this context, the Italian Society of Hygiene, Preventive Medicine and Public Health (SIIt), the Italian Multidisciplinary Society for the Prevention of Infections in Healthcare Facilities (SIMPIOS), and the National Association of Hospital Doctors (ANMDO) launched a nationwide study to assess (i) the level of awareness among Italian hospital facilities regarding the quality of water intended for human consumption, as outlined in Legislative Decree 18/23 and the requirements for drafting a WSP; (ii) the measures in place to prevent and control chemical–physical and microbiological risks in hospital water systems; and (iii) the actions needed to address any identified gaps.

The results of the chemical–physical monitoring data obtained in this study are not included in the present manuscript.

2. Materials and Methods

2.1. Study Design

This study was based on the distribution of an anonymous questionnaire, which outlined, on the front page, the survey’s main objectives and assured that the responses would be treated confidentially in aggregate form. The medical directors of three hundred hospitals were contacted by e-mail and asked to participate in this study on a voluntary basis. After giving their informed consent (as required by Italian privacy law), a contact person was identified for each hospital to be consulted in case of doubt or need regarding the compilation of the questionnaire. To answer some questions, records needed to be consulted, such as those related to microbiological and chemical analysis results and maintenance work on the water supply system. In accordance with the principles of the Declaration of Helsinki [16], this survey did not report any experiments on human subjects or human samples, nor did it include research concerning identifiable human material and data.

Data were collected between February and November 2024. To assess the accuracy of the questionnaire, an internal pre-validation procedure was conducted at the University of Bari Aldo Moro (Apulia Region, Italy) involving five hospitals (Cronbach's $\alpha = 0.83$, indicating good internal consistency).

2.2. The Questionnaire

The questionnaire was completed via the Google Form platform (<https://forms.gle/SdyQXSfd1xpejHLi7>) (accessed on 12 February 2024). It consisted of 60 questions, of which 48 were compulsory and 10 were multiple-choice, and was divided into three sections:

1. General data on the location and characteristics of the hospital (8 questions): year of construction, number of beds, source of water supply, usual water disinfection treatments, number of operating theaters, ornamental fountains, and functional rehabilitation and water birth pools;
2. Management of the water network (33 questions): knowledge of the new Dir. 2020/2184 and Italian Lgs.D. 18/23; implementation of a WSP; and chemical–physical and microbiological controls routinely performed to monitor the water network and disinfect water systems;
3. Control and prevention of legionellosis (19 questions): frequency of sampling and presence of *Legionella* in the water network during routine monitoring, level of contamination usually found, identification at genus and species level, and actions taken in case of suspected/confirmed nosocomial legionellosis.

2.3. Statistical Analyses

A descriptive statistical analysis was conducted using Microsoft Excel and R (version 4.3.3) software tools.

3. Results

Three hundred public hospitals with inpatient facilities located in 20 Italian regions were invited to participate in this study. In total, 11 regions out of 20 responded, with 102 questionnaires received from as many hospitals (response rate: 34%). Of these, 72 questionnaires were correctly completed, and only these data were included in the descriptive analysis, excluding the results of the chemical–physical monitoring, which will be the subject of a future publication. The 72 hospitals included in this study were located in the northern (33.3%), central (27.8%), and southern (38.9%) regions of Italy and proportionally reflected the distribution of hospitals among regions https://www.salute.gov.it/imgs/C_17_pubblicazioni_3523_allegato.pdf (accessed on 4 December 2024) (Figure 1). No data were available on the non-participating hospitals.

3.1. General Data on Hospital Location and Characteristics

In the present study, the hospital facilities were mostly old buildings constructed prior to 1970 (52.8%). The buildings were primarily a single-block facilities design (61.1%) and equipped with heating, ventilation, and air conditioning (HVAC systems) with adiabatic humidifiers (33.3%) and decorative fountains (30.6%). The buildings had patient wards with the number of beds at <200 (50%), 200–500 (19.4%), 501–1000 (22.2%), and >1000 (8.4%), with >10 departments (58.3%) and <10 operating theaters (63.9%). The hospital patient rooms were commonly equipped with a sink and a shower (63.9%). The water supply was mostly from an internal network connected to the public network (91.8%). Water storage tanks were present in 94.4% of cases, of which 88.9% were covered.

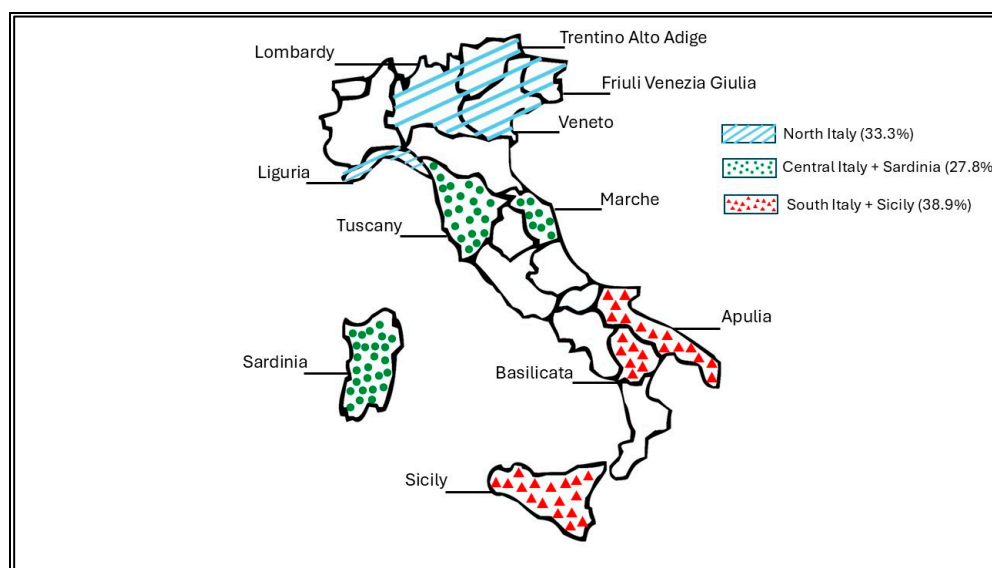


Figure 1. Italian regions enrolled in this study that returned a complete questionnaire.

3.2. Management of the Water Network

Most of the hospitals are aware of Dir. 2020/2184, Rapporti ISTISAN 22/32 (77.8%), and Italian Lgs.D. 18/23 (80.6%), with most also aware of Article 9 (77.8%), which deals with “Risk assessment and management of internal water distribution systems” and the meaning of “priority” buildings. Most of the hospitals (75%) claim to be aware of Rapporti ISTISAN 22/33 [12]. Staff training on WSPs has been conducted in a small percentage of the hospitals (13.9%) in accordance with Lgs.D. 18/23, while a WSP has been initiated in 38.9% of the cases.

All of the hospitals have an annual plan for microbiological control of the water network. Most of the hospitals collect fewer than 100 water samples per year for the detection of microorganisms that are mandatory to test for, according to Lgs.D. 18/23 (*E. coli*, *Enterococci*, *Legionella*), and optional (*Pseudomonas aeruginosa*), according to Rapporti ISTISAN 22/32 (Figures 2 and 3). The frequency of controls is mostly quarterly (Figure 4).

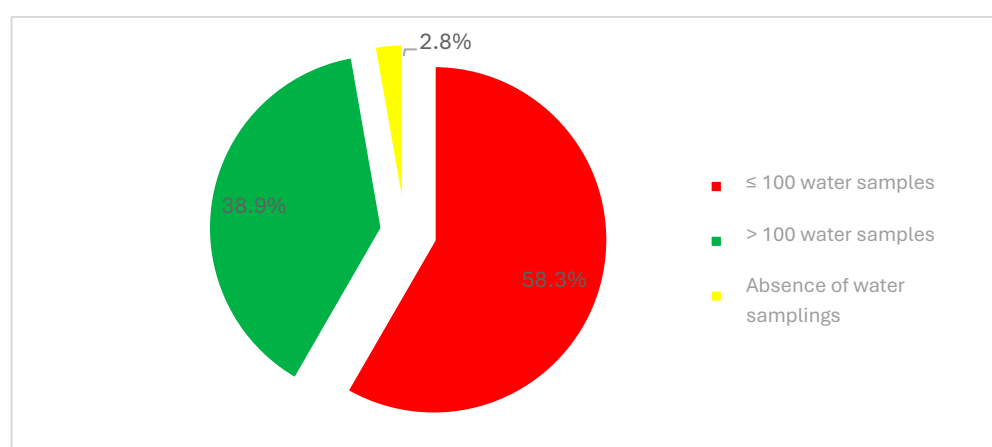


Figure 2. Number of water samples analyzed in hospitals for routine microbiological monitoring.

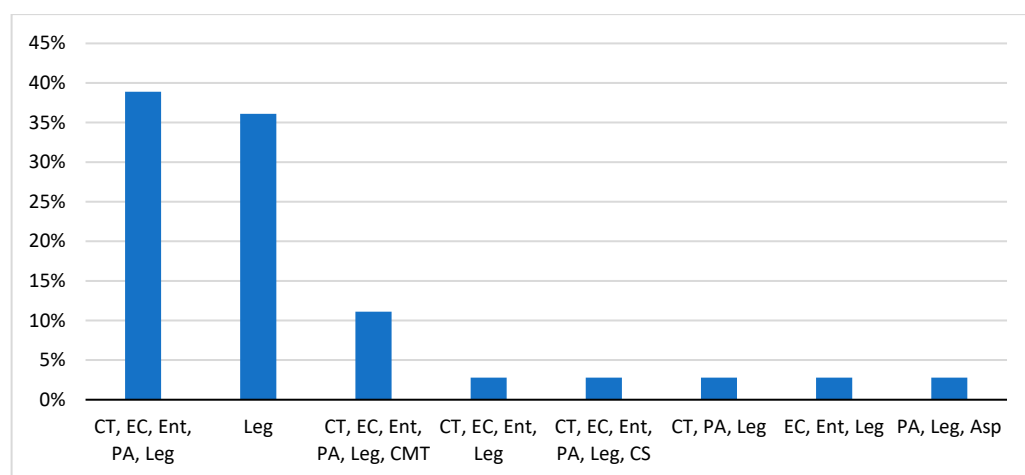


Figure 3. Frequency (%) of microbiological analyses performed on the water network, broken down by groups of microorganisms. CT = total coliforms; EC = *E. coli*; Ent = *Enterococci*; PA = *P. aeruginosa*; Leg = *Legionella*; CS = *Clostridia*; Asp = *Aspergillus*; CMT = Total Microbial Count at 22 °C.

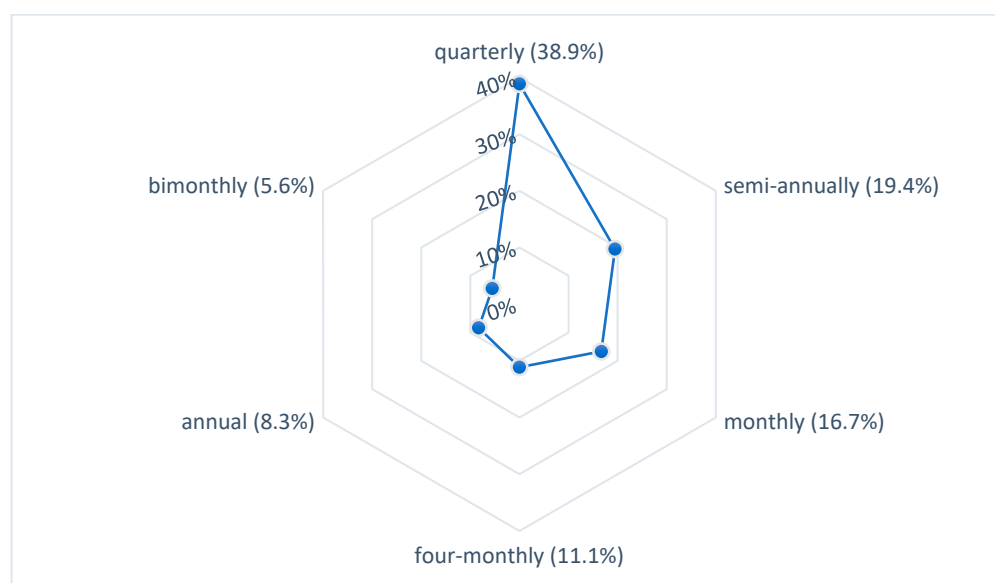


Figure 4. Frequency (%) of water network microbiological monitoring in the hospitals enrolled in this study.

The hospitals use water disinfection systems to treat both hot and cold water (69.4%), hot water only (27.8%), and cold water only (2.8%). Most always use the same method (72.2%). Figure 5 shows the type of treatment applied (some of the hospitals apply more than one water treatment).

Most of the hospitals have identified a person responsible for technical interventions on the water system (77.8%). They are provided with an updated map of the water system (55.6%), a register and a calendar of interventions (88.9% and 80.6%, respectively), a checklist (72.2%), and an archive of all maintenance operations conducted on the water system (91.7%), of which 50% are incomplete. A risk analysis has been performed in most cases (69.4%), mostly by a multidisciplinary team (50%).

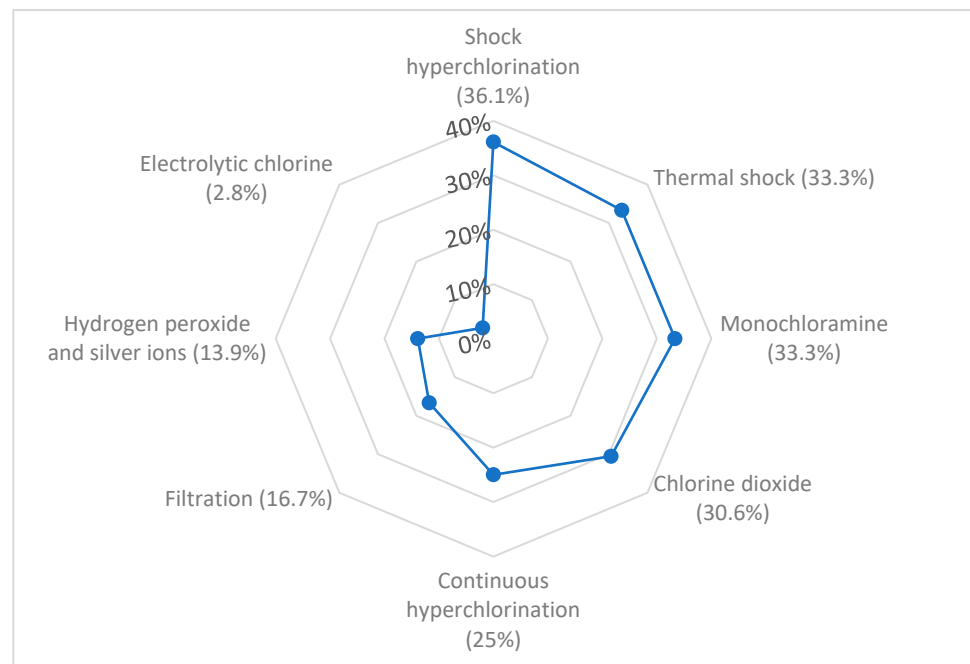


Figure 5. Type of disinfection of the water system in the hospitals enrolled in this study.

Among the critical issues that arise in the application of the WPS, according to Lgs.D. 18/23, several of the facilities (35.7%) report difficulties in identifying a qualified figure to fulfill the role of internal water distribution manager. Some of the facilities (28.6%) report a lack of health professionals specialized in prevention and public health to support water safety management, while others (28.6%) report a shortage of continuous training and updating of staff involved in water safety management. In addition, some of the facilities (35.7%) report a lack of funding as one of the main difficulties.

3.3. Control and Prevention of Legionellosis

Analyses for *Legionella* spp. are performed in all the enrolled facilities, for both hot and cold water (58.3%), every four months (50%), every six months (19.4%), monthly (16.7%), annually (5.6%), and every two months (2.8%). These tests are mostly performed by accredited private laboratories [17] (50%); most of the hospitals (94%) report that the detection rate of *Legionella* in water samples was <50% in the year 2023. The same water samples are generally also tested for other microorganisms (36.1%), in accordance with Lgs.D. 18/23 (total coliforms, *Escherichia coli*, *Enterococci*, microbial count at 22 °C) and Rapporti ISTISAN 22/32 (*Pseudomonas aeruginosa*).

The most common method used to test *Legionella* is the culture-based method (61.1%), followed by real-time PCR (11.1%) and both (27.8%). The identification of microorganisms is performed via automated MALDI-TOF (36.1%) or serological typing (75%) using polyvalent antisera for *L. pneumophila* serogroup (sg) 1, *L. pneumophila* sg 2–15, and *Legionella* species. *L. pneumophila* sg 1 is the most common serogroup (41.7%), followed by *L. pneumophila* sg 2–15 (36.1%) and *Legionella* species (22.2%). In 27.8% of the hospitals, *Legionella pneumophila* sg 2–15 strains are typed with monovalent sera.

The adopted reference limit (expressed in colony-forming units per liter, CFU/L) is <100 CFU/L in 63.3% of the hospitals. All hospitals apply measures to prevent the possible exposure of users to the risk of legionellosis (Figure 6): the regular replacement of shower heads and taps (83.3%), often combined with flushing (77%) and maintaining water temperatures >50 °C for hot water and <20 °C for cold water (69.4%). In critical cases, the disinfection (77.8%) of water systems and point-of-use filters (30.6%) are also applied.

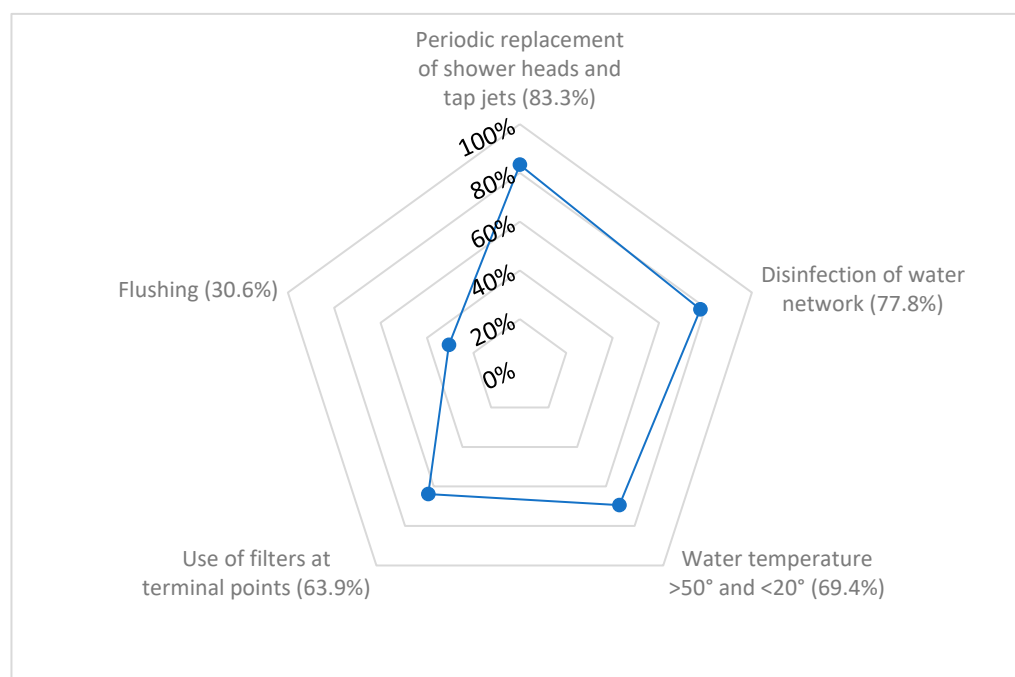


Figure 6. Actions taken to prevent the exposure of users to the risk of legionellosis.

In 27.8% of the hospitals, the medical directorates regularly train their staff in the prevention and control of legionellosis. In the case of suspected/ascertained nosocomial legionellosis, they start an epidemiological investigation (69.4%) aimed at identifying the source of infection and implement more rigorous and specific strategies to reduce the contamination of the water supply (Figure 7).

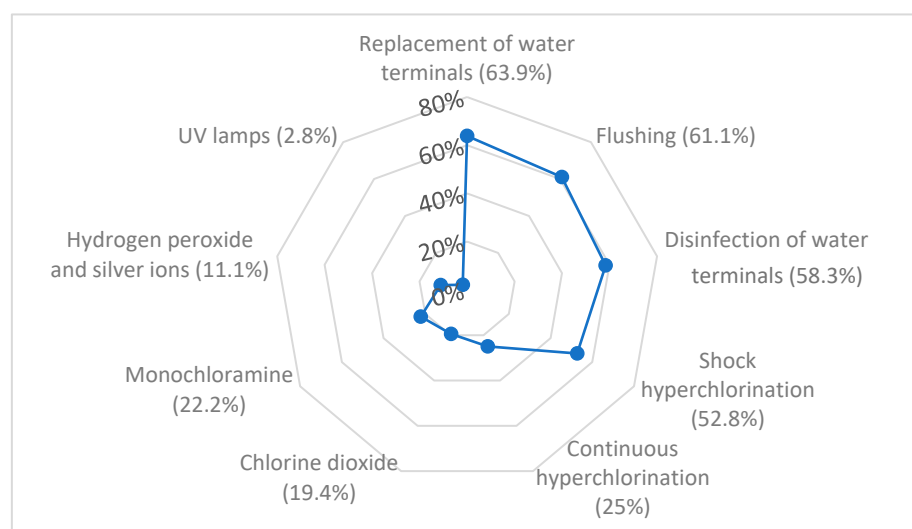


Figure 7. Interventions on the water network in cases of suspected/confirmed legionellosis of nosocomial origin.

4. Discussion

Legislative Decree 18/23, which transposed Directive (EU) 2020/2184 in Italy, marks a significant change in the approach to water safety. This new risk-based framework aims not only to protect water resources from potential hazards but also to prioritize interventions on the most critical risks along the entire drinking water supply chain, from collection, abstraction, and treatment to storage and distribution.

Among the various buildings covered by the Decree, healthcare facilities differ from other building typologies in several aspects: the complexity of their construction characteristics, the age of the water systems, the fragility of hospitalized patients, and the presence of immunosuppressed patients are some of the factors that expose patients to the risk of infection by environmental aquatic microorganisms [15]. The prevention of waterborne diseases in healthcare settings is therefore an absolute priority.

The primary objective of this study was to assess the compliance of Italian hospitals with current water safety regulations, particularly in light of Legislative Decree 18/23 and the implementation of the Water Safety Plan (WSP). Although the analysis focused on the Italian healthcare system, the findings may contribute to a broader understanding of how large, complex institutions are addressing the global challenge of water safety in clinical environments.

An important and worrying finding is the limited participation in this study: out of the 300 hospitals contacted, only 102 (34%) replied to the questionnaire. Of these, only 72 responses (70.6%) were fully completed and suitable for analysis. This low response rate highlights a widespread lack of commitment to water safety in healthcare facilities. The reasons for this gap are unclear, but may include difficulties in data collection and interpretation, inadequate staff training, and a lack of awareness of the updates introduced by the new Directive, such as the inclusion of new parameters and revised limits for the existing parameters. Despite these challenges, it is encouraging to note that most participating hospitals reported that they were aware of Directive (EU) 2020/2184, Legislative Decree 18/23, and the guidelines related to WSP implementation. However, awareness alone does not seem to translate into action: some hospitals (13.9%) have received specific training, while others (38.9%) plan to develop a WSP soon, despite the legal obligation to have one in place by 2029. This gap highlights a significant barrier to the timely and effective implementation of water safety measures, probably due to a range of behavioral, institutional, and economic barriers. In this context, behavioral barriers may include resistance to change within water utilities, where staff may be accustomed to reactive rather than preventive approaches. A shift toward proactive risk management often requires not just technical training but a cultural transformation in organizational behavior and decision-making processes [18]. Specific corrective measures should be applied, such as continuous training programs, international exchange of expertise, the adoption of standardized methodologies, and the involvement of technical authorities to mitigate system vulnerabilities and ensure water safety [19].

Another critical issue that emerges from our findings is the lack of financial resources, which is a significant barrier to the uptake of a WSP. Economically, utilities—especially in developing regions—face significant budget constraints and often lack the financial, human, and technical resources necessary for the development, implementation, and monitoring of Water Safety Plans (WSPs), which hinders sustainable risk management efforts [20]. Greater government support and sustainable investments are therefore crucial for successful WSP implementation [21]. Other European countries beyond Italy have reported significant barriers, mainly due to limited financial and human resources, as well as insufficient legislative and institutional support. In Hungary, for example, trained auditors or formalized training were not available in the initial phase of implementation; however, the introduction of a dual system that combines local and central audits has improved the effectiveness application of the WSP and operational practices [22]. Similarly, in Portugal, the lack of dedicated legislation and monitoring tools has hindered implementation, leading to calls for strategic policy and legal reforms [23]. Therefore, developing a structured and centralized strategic approach aims to transform the Water Safety Plan (WSP) into an integrated, proactive risk management framework. This transformation will be supported by regulatory obligations

and incentives, the creation of operational monitoring and benchmarking systems, and the promotion of utility self-assessments. In Germany and Austria, despite the availability of technical resources, hospitals face critical challenges due to the lack of structured water safety planning and inadequate operational procedures, which significantly impair preparedness and hinder the implementation of the WSP. To address these issues, the WSP needs to be transformed into a dynamic resilience tool tailored to the critical needs of healthcare facilities. This is possible through targeted audits of hospital water consumption, as well as through the application of alternative supply strategies, such as mobile pipeline connection or water transport vehicles, which can preserve continuity when the regular supply is disrupted [24].

These examples highlight the need for hospital health directorates to recognize the strategic importance of water safety management and allocate sufficient resources for staff training, equipment, and structural interventions. Furthermore, the establishment of a multidisciplinary team of specialists (e.g., engineers, technicians, hygienists, microbiologists, chemists), the designation of a qualified team leader, the availability of up-to-date maps of the water system, and a complete archive of maintenance activities are essential. Without such a commitment, the objectives of Directive (EU) 2020/2184 may not be achieved, leaving critical vulnerabilities in water safety and infection prevention.

Regarding water treatment, such as disinfection processes and remediation techniques, our survey shows a variety of approaches, with shock hyperchlorination being the most commonly used treatment method. Several studies highlight the effectiveness of this system, especially against *Legionella* spp. [25,26]. Other techniques, such as filtration, electrolytic chlorine, hydrogen peroxide with silver ions, and monochloramine, though mentioned, are less often used in our hospitals. Another critical issue is the repetitive nature of remediation operations, which are repeated over time without alternating with other methods. We know that the choice of products and disinfection processes is determined via tenders issued by hospitals, often valid for years and sometimes renewed as they are. Unfortunately, this practice can compromise the long-term effectiveness of treatments and contribute to the development of antimicrobial resistance and resistance to continuously used disinfectants [27–29].

The panel of microbiological parameters routinely monitored by the surveyed hospitals can be considered generally satisfactory and includes, in addition to *Legionella* spp., total coliforms, total microbial load at 22 °C, *Escherichia coli*, *Enterococci*, and *Pseudomonas aeruginosa*. This shows that the potential microbiological risks associated with the use of water are known, in accordance with the literature data [14,30–33] and in compliance with the provisions of Lgs.D. 18/23 and current guidelines [5,6,12]. The constant inclusion of *Legionella* research in microbiological investigations highlights the importance of keeping this microorganism under control, as it is notoriously considered the main cause of waterborne infections in the European Union [11,33]. Our data show that in Italy, *Legionella pneumophila* sg 1 was the most frequently detected species (57.1%) in nosocomial water systems, in agreement with national data [34]. Most of the hospitals (75%) identified *Legionella* with polyvalent antisera (*Lpn* sg 1, *Lpn* 2–15, *L. species*); only a small percentage (27.8%) identified this microorganism with monovalent antisera. This choice is often dictated by economic and time considerations. Although the identification of *Legionella* at the species and serogroup levels is of fundamental importance in environmental research, both for implementing more targeted prevention and control measures and better defining the territorial distribution of the bacterium, more accurate research and identification in clinical practice are also needed [35–37]. It is therefore essential to promote the use of more specific and sensitive analytical methods capable of identifying all potentially pathogenic *Legionella* species and establishing a correlation between clinical and environmental isolates. Some

hospitals perform *Legionella* species identification via an automated MALDI-TOF system, which can overcome some of the limitations of the serological method, such as the problem of self-agglutination and cross-reaction [37]. On the other hand, several studies report different molecular techniques, such as pulsed-field electrophoresis (PFGE) and sequence-based typing (SBT), to establish genomic correspondence between clinical and environmental isolates [36]. The presence of other serogroups of *Legionella pneumophila* in addition to *L. pneumophila* sg 1 and other *Legionella* species underlines the epidemiological complexity of legionellosis and the need for continuous and in-depth monitoring [35,37–42].

Our results showed that most hospitals still use the <100 CFU/L limit value for *Legionella* according to the Italian Guidelines for the control and prevention of Legionnaires' disease [43], by adopting a more stringent standard than the 1000 CFU/L set by Dir. 2020/2184 and Italian Lgs.D. 18/23. On the other hand, it is precisely the Directive and the national transposition that suggest that corrective actions can be considered even below the parametric value of 1000 CFU/L, considering the specific conditions and diversity of the buildings, and especially the exposed individuals, particularly in healthcare facilities where immunocompromised individuals may be at greater risk. This is in line with the findings of some authors highlighting cases of legionellosis with *Legionella* loads in water <1000 CFU/L [35,36,44].

Our study reported that only a limited number of hospitals currently use molecular techniques to detect *Legionella* in water samples. The most commonly adopted method remains the culture-based technique, which is still considered the gold standard for the detection and quantification of viable *Legionella* spp. [45]. However, this method presents several limitations, including long incubation times (up to 10 days), poor reproducibility, and an inability to detect viable but non-culturable (VBNC) cells [46]. To overcome these issues, several authors have reported the use of molecular techniques, such as real-time PCR [37,47].

The molecular method, though faster, cannot distinguish between viable and non-viable cells and may be affected by environmental interferences [48]. Furthermore, the results are expressed in genomic units rather than colony-forming units per liter (CFU/L), which remains the only legally recognized unit under the current Directive 2020/2184 and Legislative Decree 18/23 [49]. Molecular testing is thus currently considered a complementary tool, mainly useful for the rapid screening and exclusion of negative samples [50,51].

It is also important to note that all the healthcare facilities surveyed reported the implementation of preventive measures to reduce the risk of exposure to *Legionella* and limit its proliferation in water systems. Among these, the regular replacement of showerheads and tap aerators was the most adopted practice (83.3%). These measures, along with the growing awareness of *Legionella*-related risks in hospital settings, contribute significantly to reducing biofilm formation and limiting bacterial colonization [43].

Another key preventive strategy is the strict control of water temperatures. Maintaining appropriate temperature levels in the various parts of the distribution system, especially at outlets, is widely recognized as an effective method to inhibit bacterial growth [52–54]. However, despite these widespread preventive practices, the persistence of *Legionella* in some water systems highlights the importance of continuous monitoring, personnel training, and the adoption of Water Safety Plans tailored to the specific characteristics and vulnerabilities of each facility.

5. Conclusions

This study offers a meaningful case study through its systematic approach to microbiological water monitoring and its alignment with the updated European regulatory framework, as implemented in Italy via Legislative Decree 18/23. The observed variability

and challenges experienced by Italian hospitals in adopting Water Safety Plans (WSPs) reflect broader issues that may also affect other countries currently undergoing similar regulatory transitions or seeking to enhance healthcare-associated infection prevention strategies.

By identifying both the barriers and enabling factors in the implementation of WSPs within complex environments, such as healthcare facilities, this research provides practical insights that can support decision-makers, hospital administrators, and public health professionals. The findings contribute to the ongoing international discourse on risk-based water safety management and offer a reference framework for improving water quality governance in healthcare settings worldwide.

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