International Journal of Hygiene and Environmental Health 218 (2015) 677–685

Contents lists available at ScienceDirect

International Journal of Hygiene and Environmental Health

journal homepage: www.elsevier.com/locate/ijheh

An examination of the potential added value of water safety plans to the United States national drinking water legislation

Rachel Baum, Urooj Amjad, Jeanne Luh, Jamie Bartram*

The Water Institute at University of North Carolina at Chapel Hill, 135 Dauer Drive, Rosenau Hall CB #7431, Chapel Hill, NC 27599-7431, USA

ARTICLE INFO

Article history:
Received 29 August 2014
Received in revised form
29 December 2014
Accepted 29 December 2014

Keywords:
Water safety plans
Risk management
United States regulation
Water quality
Water governance
Safe Drinking Water Act

ABSTRACT

National and sub-national governments develop and enforce regulations to ensure the delivery of safe drinking water in the United States (US) and countries worldwide. However, periodic contamination events, waterborne endemic illness and outbreaks of waterborne disease still occur, illustrating that delivery of safe drinking water is not guaranteed. In this study, we examined the potential added value of a preventive risk management approach, specifically, water safety plans (WSPs), in the US in order to improve drinking water quality. We undertook a comparative analysis between US drinking water regulations and WSP steps to analyze the similarities and differences between them, and identify how WSPs might complement drinking water regulations in the US. Findings show that US drinking water regulations and WSP steps were aligned in the areas of describing the water supply system and defining monitoring and controls. However, gaps exist between US drinking water regulations and WSPs in the areas of team procedures and training, internal risk assessment and prioritization, and management procedures and plans. The study contributes to understanding both required and voluntary drinking water management practices in the US and how implementing water safety plans could benefit water systems to improve drinking water quality and human health.

© 2015 Elsevier GmbH. All rights reserved.

Introduction

The effective management of drinking water systems is critical to ensure the delivery of safe drinking water. Water safety plans (WSPs) offer an internationally recognized systematic risk management approach to enhance water quality from source to tap that has been used in both developed and developing countries (Bartram et al., 2009; Mahmud et al., 2007). Through the implementation of this risk management approach, water systems have seen improved water quality, regulatory compliance, communication, asset management, and public health outcomes (Gunnarsdottir et al., 2012).

Despite the documented benefits of WSPs, they have had limited application in the United States (US). Accordingly, the purpose of our research was to compare current US drinking water regulations to WSPs. Given the regulations that exist in the US, we explored the differences between current regulations and WSPs and whether there might be added value from WSPs to assist in improving drinking water quality. This article begins with descriptions of US drinking water regulations, voluntary US drinking water enhancement programs, and WSPs. It continues with a comparative analysis between US drinking water regulations and WSP steps in order to identify the differences between the two, followed by a discussion on the potential of addressing these differences to improve the safety of US drinking water systems.

History of US drinking water regulations

In 1914, the US Public Health Service set microbiological drinking water quality standards for water systems providing water to interstate transporters. By 1962, the US Public Health Service was regulating 28 contaminants in an effort to control end product water quality. Although these standards did not apply to public water systems, most states adopted these standards as guidelines (USEPA, 2013). As treated water quality testing became more frequent, more water system deficiencies were found and water contamination became increasingly recognized (USEPA, 2013). As a result of these findings, environmental concerns came to the forefront of Congress, resulting in the passage of the Water Pollution Control Act, National Environmental Policy Act, and the Safe Drinking Water Act (SDWA). The SDWA and its amendments are the main sources in the US from which drinking water regulations were created to ensure the quality of drinking water treated and delivered from public water systems (Title XIV, 2002). The Environmental

* Corresponding author. Tel.: +1 919 966 2480.
E-mail addresses: rbaum@email.unc.edu (R. Baum), amjad@email.unc.edu (U. Amjad), jluh@email.unc.edu (J. Luh), jbartram@email.unc.edu (J. Bartram).

http://dx.doi.org/10.1016/j.ijheh.2014.12.004
1438-4639/© 2015 Elsevier GmbH. All rights reserved.

Protection Agency (EPA), an agency of the federal government, is responsible for writing regulations to enforce this legislation and as a result, has established the National Primary Drinking Water Regulations, National Primary Drinking Water Regulations Implementation, and National Secondary Drinking Water Regulations (Code of Federal Regulations Title 40, Parts 141–143) (Code of Federal Regulations, 2013).

The SDWA requirements, with which approximately 150,000 public water systems in the US must comply, include water quality standards to be met, treatment levels to be applied, system management to be conducted, and external communication to be managed (Title XIV, 2002). Primacy agencies (regulation enforcers for the states) then develop regulations based upon the SDWA, which sets the foundation on which water suppliers act, with the goal of meeting developed regulations. Public water system operators must submit reports to primacy agencies identifying violations of drinking water standards, violations in monitoring, and violations in consumer notification (Title XIV, 2002). Based upon these reports, primacy agencies issue compliance orders against the system supplier (Title XIV, 2002) (SDWA, Sec 1414). Enforcement is prioritized by targeting water system suppliers with a history of violations and systems that most immediately and significantly compromise public health. Primacy agencies are in charge of enforcement and penalties, however the EPA will step in when needed. The goal of the EPA, in regard to water systems, is for all water systems to attain compliance levels or return to compliance levels within six months of a violation (USEPA Office of Enforcement and Compliance Assurance, 2009).

While the United States has a system of periodic testing for contamination, and responding to detected risks, outbreaks have been documented in systems that comply with SDWA regulatory requirements. From January to December 2011, it was estimated that 25% of the US water treatment systems had violated the SDWA (USEPA 305RI3002, 2013). Of these violations, 25% were of health-based standards (USEPA 305RI3002, 2013). These health-based standards violations contribute to microbial waterborne illnesses, which are estimated to affect 19.5 million Americans annually (Reynolds et al., 2008). However, these waterborne illnesses are the result of both regulated and non-regulated contaminants. For example, algal blooms in the Great Lakes recently caused the shutdown of a local drinking water treatment plant following voluntary testing of cyanotoxins (Yeager-Kozacek, 2013), an unregulated contaminant group produced by algal blooms which poses a health risk to humans (USEPA 4304T, 2013). Cyanotoxins are currently on the Contaminant Candidate List to be considered for regulation in the next five years, however until cyanotoxin testing becomes regulated, some drinking water systems may not test for these compounds and thereby not take precautions against them.

Voluntary US drinking water quality optimization programs

Voluntary initiatives to improve drinking water quality in the US, such as the Partnership for Safe Water and the Area-Wide Optimization Program have reported success in improving drinking water quality (AWWA, 2013; Sadosky, 2013), suggesting that enhancement programs lead to benefits. These voluntary programs have similar goals to US regulations and WSPs (i.e., to improve drinking water quality). All of these voluntary programs aim to improve drinking water quality through additional monitoring and controls beyond current drinking water regulatory requirements in the US. The purpose of the following discussion of voluntary programs is to show how such non-required guidelines complement the regulations stemming from the SDWA. Examining this relationship between existing voluntary standards and regulations is useful in setting up the comparative analysis to follow, as WSPs are an example of voluntary guidelines that would potentially complement existing US regulations of drinking water quality.

The Partnership for Safe Water, an Enterprise Department of the American Water Works Association (AWWA), works to improve treatment and distribution performance through self-assessment programs, data analysis, and optimization programs. Since its inception in 1995, the Partnership for Safe Water has documented improved teamwork in water systems, greater customer confidence, cost effective optimization solutions, and improvements in water quality delivered to customers (AWWA, 2013). The Partnership for Safe Water focuses its data analysis on four indicators – turbidity, disinfectant residuals, pressure, and main break frequency – and thus differs from WSPs as the number of indicators for WSPs is tailored for each system. Additionally, the Partnership for Safe Water focuses on an annual data analysis process that differs from the WSP emphasis on continually documenting changes and revising approaches. AWWA also created AWWA Standard G200-04 – Distribution Systems Operation and Management in 2004 to further improve water quality management in a water system (AWWA, 2004). This standard was very similar to a WSP, in that it called for the assessment of hazards throughout the water system and the creation of operational and maintenance plans for water system management (Kirmeyer, 2007). While pilot studies were conducted to evaluate this Standard, it was ultimately not pursued nationwide.

The EPA developed a program similar to the Partnership for Safe Water in 1998, the Area-Wide Optimization Program (AWOP) for water systems, which focuses on decreasing turbidity of treated water through comprehensive performance analysis (USEPA AWOP, 2013). AWOP also provides performance-based training programs to educate suppliers on how to improve treatment processes. Most recently, the EPA has created additional programs for disinfection byproducts reduction for surface water plants and groundwater system optimization for groundwater-fed systems (USEPA AWOP, 2013). System operators that are committed to AWOP have reported improvements in water quality (Sadosky, 2013). However, water system leaders have expressed difficulty in committing to this program due to lack of time and money (Sadosky, 2013). AWOP improves upon current regulations from the SDWA to ensure water system quality and performance by focusing on decreased water turbidity and improved treatment processes. AWOP differs from WSPs in its focus on two specific indicators while WSPs develop indicators for each utility, based upon specific needs. The processes for AWOP focus on data analysis of indicators to see the results of optimization, while WSPs focus on improving monitoring and documentation through management processes to prevent contamination.

The American National Standards Institute (ANSI) and AWWA recently produced the J100 Risk Analysis and Management for Critical Asset Protection (RAMCAP) Standard for Risk and Resilience Management of Water and Wastewater Systems (McLaughlin, 2013). The J100 RAMCAP is focused on assessment of not only water quality, but also water quantity and public confidence. The foundation of the assessment is in the RAMCAP process, which consists of: asset characterization, threat characterization, consequence analysis, vulnerability analysis, threat analysis, risk/resilience analysis, and risk/resilience management (Morley, 2012). This seven-step process aligns with the WSP identification of hazards, risks, and controls, however RAMCAP has a particular focus on risk and resilience, with less emphasis on team development, communication, and documentation. There has been limited adoption of the J100 in the US, as it was developed in 2010, and the benefits resulting from J100 adoption have not been assessed yet.

Download English Version:

https://daneshyari.com/en/article/5854568

Download Persian Version:

https://daneshyari.com/article/5854568

Daneshyari.com