ABSTRACT

Identifying water contamination from syndromic surveillance signals

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Objective

To develop standard operating procedures (SOPs) to identify or rule out possible water contamination as a cause for a syndromic surveillance alarm.

Introduction

The EPA Water Security initiative contamination warning system (CWS)[1] detection strategy involves the use of multiple monitoring and surveillance components for timely detection of drinking water contamination in the distribution system. The public health surveillance (PHS) component of the contamination warning system involves the analysis of health-related data to identify disease events that may stem from drinking water contamination. Public health data include hospital admission reports, infectious disease surveillance, emergency medical service reports, 911 calls and poison control center (PCC) calls. Automated analysis of these data streams results in alerts, which are investigated by health department epidemiologists. A comprehensive operational strategy was developed to describe the processes and procedures involved in the the initial investigation and validation of a PHS alert. The operational strategy established specific roles and responsibilities, and detailed procedural flow descriptions. The procedural flow concluded with the determination of whether or not an alert generated from surveillance of public health data streams is indicative of a possible water contamination incident.

Methods

Cincinnati was chosen to be the first pilot city for implementation of a drinking water CWS. Over the course of development and deployment of the PHS component, local partners from the Greater Cincinnati Water Works (GCWW), Cincinnati Fire Department (CFD), city and county health departments, PCC and local and federal law enforcement met quarterly to develop and test the PHS alert response strategy. Initially, alerts were received by the health department or PCC. Owing to the branching and looping flow patterns within water distribution systems, water contamination, particularly with extremely toxic chemicals, will likely feature spatial clustering of cases with similar medical complaints. If the underlying data for the alert demonstrates clustering of cases with similar symptoms, the epidemiologist will investigate other public health data streams for corresponding trends. If the investigator believes that water contamination could be the cause of the alert, regardless of whether it is the primary suspected cause, all local partners convene to discuss the alert. GCWW provides information on water quality data and customer complaints from the impacted area. CFD reports or confirms unusual activity from emergency responders. PCC specialists provide information on PCC calls as well as expert toxicological interpretation of the data. On the basis of all information gathered, the utility and local partners make a joint decision regarding whether water contamination is possible.

Results

In addition to routine false alarm investigations, the operational procedures were evaluated during exercises involving simulated water contamination. The exercises illustrated the value of leveraging knowledge from multiple disciplines. Possible water contamination determinations were made in ∼90 min based on the correlation of public health alerts with anomalous water quality data. Additionally, PCC specialists assisted GCWW to prioritize its sampling strategy on the basis of suspected contaminants. During exercise debriefs, all partners agreed that the communication resulted in increased confidence in the joint decision that water contamination was possible. Although water contamination is often ruled out for PHS alerts on the basis of initial criteria, in one instance the partners were convened to discuss an alert generated by multiple EMS runs involving respiratory distress in the central business district of Cincinnati. The investigator suspected that the alert was the result of a weekend festival coinciding with a heat wave. However, the alert met the clustering of similar cases criteria.

After convening a 15 min conference call in which GCWW reported no anomalous water quality or utility conditions in and around the area, the alert was attributed to the heat wave.

Conclusions

The Cincinnati pilot applied an effective procedure for identifying possible water contamination from syndromic surveillance alerts.

Acknowledgements

Reference

1 US EPA. Water Security Initiative: Interim Guidance on Developing an Operational Strategy for Contamination Warning Systems. EPA 817-R-08-002 2008.

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