ABSTRACT

OutbreakMD: tracking and identifying disease outbreaks in post-earthquake Haiti

R Chunara, C Freifeld, and JS Brownstein

Children's Hospital Informatics Program, Children's Hospital Boston, Boston, MA, USA
E-mail: chunara@gmail.com

Objective

OutbreakMD is a mobile Web application that was piloted in post-earthquake Port-au-Prince, Haiti. The application is designed for collecting, organizing and visualizing clinical information from individual patients to better monitor emerging infectious disease in disaster situations, in situations with limited public health infrastructure and unreliable Internet connectivity.

Introduction

HealthMap is a real-time disease epidemic intelligence tracking and visualization system that collects information from general news media, individual first-hand reports and public health sources around the world. Gaps in this effort clearly occur during times of crisis where traditional mechanisms may be dismantled. Clinical information gathered by deployed physicians can play a key role in providing early insight on emerging public health threats. We developed OutbreakMD to gather such information in real-time and combine with existing HealthMap informal and formal surveillance techniques.

With Haiti already carrying a significant endemic burden of infectious disease, including tuberculosis, malaria, and HIV, the aftermath of the earthquake of January 12, 2010 has exacerbated the spread of disease while treatment capacity has diminished. This application allows a clinician to rapidly enter patient demographics and case information, and then identify high-risk areas and times by examining the aggregated data spatially and temporally. These insights can be coupled with other public health information sources and can be used to inform responders on how to best target prevention such as vector control and water purification, as well as to identify internally displaced person camps and other specific communities where additional resources are needed.

Methods

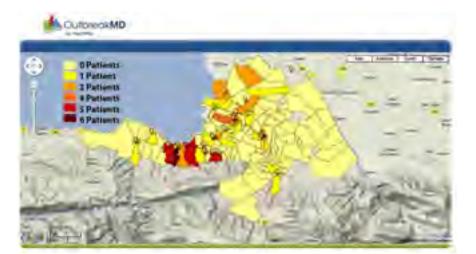Implemented in HTML5, a new Web standard that supports offline data storage, OutbreakMD can be used to collect data

Figure 1 Distribution of all patients documented. Patient locations of origin are denoted by a marker (yellow for patients presenting with tuberculosis symptoms, red for malaria) for cases where exact geolocation was possible; else more generically, by the Quartier of origin (polygon).

even when no network connection is available. Once a connection becomes available, the system automatically uploads stored reports to a secure online database, capturing patient demographics, address, symptom and clinical test results. Seamless online and offline use makes the application particularly suited to resource poor settings where both Internet and cell phone connectivity are available but often unreliable. Although the current version is designed for the Apple iPad, OutbreakMD is compatible with a range of mobile devices such as iPhone, Android and desktop browsers, so the application can be easily carried and used in the clinic. Once the data are captured and synchronized online, a time-series view of the number of unique patients presenting with symptoms in each of the disease categories, as well as spatial visualization of patient locations (Figure 1) are generated in real-time from the electronic records and made available online.

Results

Over the course of three months subsequent to the Haiti earthquake, data was collected from 117 unique patients. We found that the predominant disease burden was of Tuberculosis, with distribution highest in South Central Port-au-Prince; however a greater number of cases

is required for statistical significance. We are currently examining how resolution (exact latitude and longitude versus suburb-level location) affects spatial visualization of the information. This will be relevant in order to automate data processing for locations that are not readily mapped (such as informal camps) while maintaining the quality of information. With enough volume of patient information we will be able to evaluate which levels of spatial resolution will be useful for population public health surveillance.

Conclusion

OutbreakMD is a platform for real-time collection of clinical data in the field with the goal of rapid public health surveillance in disasters and resource-poor settings, and the potential to play a key role in closing the loop between clinical providers and responders.

Acknowledgements

6