

Implementation of a Mobile-Based Surveillance System in Saudi Arabia for the 2009 Hajj

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Objective

To develop and implement a mobile-based disease surveillance system in the Kingdom of Saudi Arabia (KSA) for the 2009 Hajj; to strengthen public health preparedness for the H1N1 Influenza A pandemic.

Introduction

The Hajj is considered to be the largest mass gathering to date, attracting an estimated 2.5 million Muslims from more than 160 countries annually (1). The H1N1 Influenza A pandemic of 2009 generated a global wave of concern among public health departments that resulted in the institution of preventive measures to limit transmission of the disease. Meanwhile, the pandemic amplified an urgent need for more innovative disease surveillance tools to combat disease outbreaks.

A collaborative effort between the KSA Ministry of Health (MOH) and the U.S. Centers for Disease Control and Prevention (CDC) was initiated to implement and deploy an informatics-based mobile solution to provide early detection and reporting of disease outbreaks during the 2009 Hajj. The mobile-based tool aimed to improve the efficiency of disease case reporting, recognize potential outbreaks, and enhance the MOH's operational effectiveness in deploying resources (2).

Methods

We designed a case-based system consisting of a mobile-based data collection toolkit and interactive map-based user interface to perform geospatial analysis and visualization. A train-the-trainer approach was adapted to provide training to the KSA MOH.

Results

More than 200 public health and information and communication technology (ICT) professionals were trained, and 100 mobile devices were deployed during the 2009 Hajj. Nine diseases and conditions that were considered as highest priority during the Hajj were under surveillance, including H1N1 Influenza A and Influenza-like Illness.

Pilot testing of the system was conducted during the first week of Ramadan and a modified system was fully operational during the Hajj. Data collected on smartphones were sent to the system via a secured network. The data were processed immediately and visualized on highly interactive maps with local and global views.

Conclusions

Effective public health decision-making requires timely and accurate information from a variety of sources. Mobile-based systems (e.g., personal digital assistants and smartphones) for data collection, transmission, reporting, and analyses provide a faster, easier, and cheaper means to communicate standardized and shareable public

health data for decision-making (3). Mobile-based systems have been recognized as a quick and effective response solution to mass gatherings and recommended as data gathering and communication systems with geographical information system (GIS) capability (2). This paper explored the development and implementation of the Global Positioning System/ Geographic Information System (GPS/GIS) enabled mobile-based disease surveillance system as a feasible and effective way to support and strengthen preparedness for H1N1 Influenza A during the 2009 Hajj.

Mobile computing technology can be utilized to provide rapid and accurate data collection for public health decision-making during mass gatherings. The GIS-based interactive mapping tool provided a pioneering example of the power of a geographically based internet-accessible surveillance system with real-time data visualization. The technical challenges in the process of implementation and in the field were also identified.

A need now exists for a comprehensive and comparative review of parameters such as handheld device cost, training required, and system evaluations because selecting the appropriate software/hardware and system remains a challenge not only to public health professionals, but to the development and application of informatics technology as well.

Keywords

Mobile Technology; GIS/GPS; Mass Gatherings; Surveillance System; Public Health Preparedness

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