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ABSTRACT

SAGES: a suite of freely available software tools for electronic disease surveillance in resource-limited settings

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Objective

This paper describes the development of the Suite for Automated Global bioSurveillance (SAGES), a collection of freely available software tools intended to enhance electronic disease surveillance in resource-limited settings around the world.

Introduction

Emerging and re-emerging infectious diseases are a serious threat to global public health.[1,2] The World Health Organization (WHO) has identified more than 1100 epidemic events worldwide in the last 5 years alone.[3] Recently, the emergence of the novel 2009 influenza A (H1N1) virus and the SARS coronavirus has demonstrated how rapidly pathogens can spread worldwide. This infectious disease threat, combined with a concern over man-made biological or chemical events, spurred WHO to update their International Health Regulations (IHR) in 2005.[4] The new 2005 IHR, a legally binding instrument for all 194 WHO member countries, significantly expanded the scope of reportable conditions, and are intended to help prevent and respond to global public health threats. SAGES aims to improve local public health surveillance and IHR compliance, with particular emphasis on resource-limited settings.

Methods

More than a decade ago, in collaboration with the US Department of Defense (DoD), the Johns Hopkins University Applied Physics Laboratory (JHU/APL) developed the Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE). The current SAGES initiative leverages the experience gained in the development of ESSENCE; the analysis and visualization components of SAGES are built with the same functionalities in mind. Cognizant of work underway on individual surveillance systems components, for example, collection of data by cell phones, we have focused our efforts on the integration of inexpensive, interoperable software tools that facilitate regional public health collaborations.

Results

SAGES tools are organized into four categories: (1) data collection, (2) analysis and visualization, (3) communications, and (4) modeling/simulation/evaluation. Within each category, SAGES offers a variety of tools compatible with surveillance needs and different types or levels of information technology infrastructure. In addition to the flexibility of tool selection, there is flexibility in the sense that the analysis tools do not require a fixed database format. For example, rather than requiring an existing database to adapt to the tool, the SAGES database tools adapt to the format of all Java database compliant formats. Lastly, the SAGES tools are modular in nature, allowing the user to select one or more tools to enhance an existing surveillance system, or use the tools *en masse* for an end-to-end electronic disease surveillance capability. Thus, each locality can select tools from SAGES based upon their needs, capabilities, and existing systems to create a customized electronic disease surveillance system.

Conclusions

We have combined electronic disease surveillance tools developed at the Johns Hopkins University Applied Physics Laboratory with other freely available, interoperable software products to create SAGES. We believe this suite of tools will facilitate local electronic disease surveillance, regional public health collaborations, and international disease reporting. The Armed Forces Health Surveillance Center

welcomes inquiries on the SAGES tools from interested WHO member countries.

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