

Challenges of Introducing Disease Surveillance Technology in Developing Countries: Experiences from India and Sri Lanka

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OBJECTIVE

We review challenges faced during the initial period of implementation of a Real-Time Biosurveillance Program (RTBP) in developing countries.

BACKGROUND

Modern information and communication technologies play increasingly prominent roles in health care systems. To capitalize on attainable benefits it is essential to thoroughly and purposefully weave them into the existing business processes. The challenges of doing so can be exacerbated by specific local circumstances of developing countries. We share our experiences from fielding a system designed to support real time collection and analysis of public health data in rural areas of Sri Lanka and India. Its strong transformational potential has been proven, however success of the ultimate field use requires overcoming multiple organizational and utility challenges.

METHODS

RTBP comprises of three functional modules: data collection, event detection and analysis, and alerting [1]. Data collection relies on a mobile phone application *mHealthsurvey* to transfer paper records of outpatient visits to a central database. The data is then analyzed using *T-Cube Web Interface* (TCWI) – a web browser based tool for event detection and interactive statistical analysis and visualization. Alerts raised using TCWI are disseminated through the *Sahana Alerting Broker* to designated responders and health officials via SMS, Email, and Web postings. RTBP business process involves data collection personnel, analysts, and responders. Technology must be tailored to match the capabilities of human resources and fit within limitations of available infrastructure.

RESULTS AND CONCLUSION

Health officials were initially exposed to a generic version of TCWI. It provided a wide range of richly parameterized analytic algorithms to interactively process daily loads of data. The RTBP team was quick to realize that health officials in India and Sri Lanka had limited hands-on experience with advanced statistical analyses, despite having learned advanced statistics as part of their curricula. On the other hand, the primary duty of an epidemiologist is to monitor a set of routine hypotheses involving escalating fever diseases, communicable diseases, and unusual clusters of patients reporting with common

symptoms. The subsequent revision of TCWI featured a vastly simplified and hence less intimidating user interface. It included one-button invocation of the results of routine surveillance using massive screening and pivot tables functions. This automated process presents the epidemiologist with a daily ranked list of possible disease outbreaks and simple means of interactive evaluation of findings to decide whether any required response or mitigation actions.

Health officials have been comfortable with the preexisting paper-based disease notification process. It is limited to monitoring, reporting, and responding to some 25 notifiable disease cases, so the comprehensiveness of RTBP imposed a change of the mindset of its users. Initially, it was not easy to sell them on the importance of syndromic surveillance. But, doctors in developing countries examine about 100 patients a day and even experienced physicians cannot fully diagnose more than 20% of their patients. The rest receives uncertain preliminary diagnoses. Since unlike the original system RTBP can record syndromes, it can identify escalating clusters of disease despite the limited accuracy of diagnostic data.

Another issue affecting reliability of event detection was the ability of health workers to submit accurate data. Initially, we saw multiple instances of systematic data entry errors such as entering a lexically close but incorrect disease name (whooping cough for worm infestation), misrepresenting health events (reporting toxoid vaccinations as cases of typhoid), and the actual patient visitation date, or delays in data submission combined with errors in case date stamps.

Successful deployment of a sophisticated system like RTBP in a developing country requires a top-down-bottom-up, iterative, use-case-oriented approach. Close collaboration between developers, implementers, and users, and extensive field testing allow identifying challenges, overcoming them, and achieving practical solutions. RTBP is currently used in the field benefiting vulnerable populations in pilot regions of India and Sri Lanka.

REFERENCES AND ACKNOWLEDGEMENTS

[1] Waidyanatha, N., Sampath, C., Dubrawski, A., Prashant, S., Ganesan, M., Gow, G. Affordable system for rapid detection and mitigation of emerging diseases. *International Journal on E-Health and Medical Communications*, 2010.

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