Disease Surveillance-The Road Ahead

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As per definition, surveillance is the ongoing systematic collection, analysis and interpretation of health data essential to planning, implementation and evaluation of public health practice, closely integrated with the timely dissemination of this data to those who need to know.

Various diseases that afflict humanity are of multiple types and vary in their presentation. Some of the diseases may occur as outbreaks like SARS(Sub acute respiratory syndrome) in Hong Kong and Ebola in Congo and these diseases call for a rapid response. Other diseases especially Non-Communicable Diseases like Diabetes and Hypertension require a more planned and sustained effort. Many countries have formal disease surveillance in place to collect the relevant data to guide the responses against the diseases. Surveillance data are collected either passively or actively. Passive Surveillance remains the predominant way that the case information is reported to public health officials. On the other hand, active surveillance relies on the overt efforts of public health officials to proactively identify and report cases of diseases. Unlike passive surveillance system, active surveillance is typically timely, complete and inclusive. But with few exceptions, public health agencies usually lack the resources to conduct widespread, comprehensive active disease surveillance.

The information generated through disease surveillance can be used:

i. To evaluate the effectiveness and control of preventive health measures,

ii. To monitor changes in infectious agents; for example trends in development of antimicrobial resistance,

iii. To support health planning and the allocation of appropriate resources within the health care system,

iv. To identify high risk population/areas to target interventions, and

v. To provide a valuable archive of disease activity for future reference.

The ubiquity of internet and mobile phones are becoming an important, even if not an entirely reliable, added source for data in many developing countries. While, drawing credible inferences from public social media still needs a lot of work, other avenues discussed below have proved to be more promising.

Health Map: It is a freely accessible automated electronic information system for monitoring, organizing and visualizing reports of global disease outbreaks according to geography, time and infectious disease agent (1, 2). It offers real time surveillance data globally collected from news aggregators, eyewitness reports, curated discussions and validated official reports.

It is used both as an early detection system and supports situational awareness by providing current, highly local information about outbreaks even from areas relatively invisible to traditional global public health efforts. In 2014, it was the first to report a rise in cases of a "mystery hemorrhagic fever" which was later confirmed by WHO as Ebola outbreak. Principle objective of Health Map is to provide access to the greatest amount of

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potentially useful health information across the widest range of geography and pathogens without overwhelming the user with excess information or obscuring important and urgent elements. For this goal to be accomplished, system must be able to correctly classify reports, provide useful visualization output and be responsive under heavy usage load.

Pro-MED Mail (Programme for Monitoring Emerging Diseases) -

It is among the largest publicly available emerging diseases and outbreak reporting system in the world. It aims to promote communication amongst the international infectious disease community (including scientists, physicians, veterinarians, epidemiologists, public health professionals). Guiding principles for Pro-MED Mail are:

i. Transparency and a commitment to the unfettered flow of outbreak information.

ii. Freedom from political constraints

iii. Availability to all without cost

iv. Commitment to one Health

v. Service to the global health community.

One health is the principle that human, animal and environmental health is inextricably linked and should no longer be researched and learned in a siloed manner. In 1999, Pro-MED became a programme of the international society for infectious diseases. Among the essential global health priorities, one of the main priority is the timely recognition and reporting of emerging and re-emerging infectious diseases as it enables co-ordinated and rapid response to an outbreak, thus preventing the catastrophic morbidity and mortality. The epidemiological data in Pro-MED has been used to estimate mortality rates and demographic parameters for specific diseases (3,4).

Epicore: It draws on the local knowledge of a global community of volunteer human, animal and environmental health professionals (known as responders) to verify reports from formal and informal sources on disease outbreaks in their own geographical region. Epicore is a virtual community of health professionals to verify information on disease outbreaks. When evidence of an outbreak is found, local information is requested from epicore members.

Although these newer channels cannot form the primary basis of a robust surveillance system in any country but they have the potential to provide early warnings and added feedback. At present, automated surveillance systems have the capacity to amass and sort vast amounts of heterogeneous data for patterns and abnormalities. Also Artificial Intelligence (AI) technology can be useful for contact tracing within large datasets during an outbreak. Ultimately the success of AI in disease surveillance rests on how well we innovate and prepare for health systems of the future.

Disease Surveillance is key to strengthen the health care system of a country. Building such a system requires concerted action to establish both passive and active data collection capability; the mining of all available data from multiple sources such as news, media and health workers, and above all building a strong single point of focus to aggregate, triangulate, analyse and act on this information.

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