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Public Health Surveillance: At the Core of the Global Health Security Agenda

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Abstract

Global health security involves developing the infrastructure and capacity to protect the health of people and societies worldwide. The acceleration of global travel and trade poses greater opportunities for infectious diseases to emerge and spread. The International Health Regulations (IHR) were adopted in 2005 with the intent of proactively developing public health systems that could react to the spread of infectious disease and provide better containment. Various challenges delayed adherence to the IHR. The Global Health Security Agenda came about as an international collaborative effort, working multilaterally among governments and across sectors, seeking to implement the IHR and develop the capacities to prevent, detect, and respond to public health emergencies of international concern. When examining the recent West African Ebola epidemic as a case study for global health security, both strengths and weaknesses in the public health response are evident. The central role of public health surveillance is a lesson reiterated by Ebola. Through further implementation of the Global Health Security Agenda, identified gaps in surveillance can be filled and global health security strengthened.

AS THE WORLD BECOMES more interconnected through globalized travel and trade, the international spread of infectious diseases has become an increasing threat.¹ To address these ever-evolving risks to health, dependence on public health surveillance has become more significant. Effective surveillance can respond not only to emergent infectious disease threats, but also to longer term public health concerns, including drug-resistant organisms and potential bioterrorism. In the wake of the recent West African Ebola epidemic, it is clear that in the pursuit of global health security, all nations must support each other in developing basic public health infrastructure and shoring up their surveillance capacity.²

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The Global Health Security Agenda (GHSA) seeks to enhance surveillance worldwide, directly support responses to infectious disease outbreaks, and ultimately improve global health security. The emergence of novel infectious diseases is inevitable, but through participation in the GHSA, the resulting consequences can be minimized. Surveillance is fundamental to global health security, and the West African Ebola outbreak showed both the devastating consequences of surveillance gaps and how effective surveillance could serve as a firewall against further geographic spread of deadly viruses. The GHSA seeks to fill the gaps in surveillance exposed by Ebola, thereby improving global health security.

Making Global Health Security a Reality

The 2003 emergence of severe acute respiratory syndrome (SARS) sparked a strategic shift in the global public health community's response to infectious disease outbreaks and other threats to health.³ To better address newly emerging risks, the World Health Organization (WHO) and its member states revised and adopted the International Health Regulations (IHR) in 2005.⁴ This legally binding treaty was meant to strengthen the capacity of countries globally to detect and respond to public health threats.³ The IHR treaty defines specific events that have the potential to become a Public Health Emergency of International Concern (PHEIC) and requires their reporting to the WHO within 24 hours of their detection.^{3,5} Although the revised IHR were unanimously adopted, countries have been slow to implement the new regulations. The IHR required the development and implementation of minimum core public health capacities by June 2012; however, almost 10 years after the revision was adopted, by self-report, only 30% ($n = 64$) of the world's countries have met the treaty requirements.^{6,7}

In an effort to spur progress toward full IHR compliance, the GHSA was launched in 2014. The GHSA represents a joint effort by the Centers for Disease Control and Prevention (CDC), other US government agencies, other nations, and public and private partners. The GHSA is a voluntary international collaboration that aims to support all countries in meeting IHR regulations and ensuring global health security. The GHSA consists of 3 main objectives: preventing, detecting, and responding effectively to public health emergencies of international concern. These 3 objectives are broken down further into a total of 11 action packages. Each action package outlines specific activities and measurable benchmarks, with the goal of implementing the objective and better securing global health security.⁸ The GHSA website (ghsagenda.org) describes each of the action packages and provides updates on GHSA progress.⁹ Enhancing surveillance is a fundamental principle in the overall framework of GHSA. When performed effectively, surveillance informs each of the 3 GHSA objectives and minimizes the population impact of public health threats.

Ebola and Global Health Security

As of February 7, 2016, the Ebola epidemic had taken 11,301 lives and sickened 28,603.¹⁰ A World Bank economic update produced in April 2015 found that the cost to the 3 most affected countries—Guinea, Sierra Leone, and Liberia—was more than \$2.2 billion.¹¹ After the outbreak was first recognized, the global community looked to surveillance to inform decisions about how best to respond. Unfortunately, in many instances, the surveillance

systems were not in place and the data were unavailable, delayed, or incomplete, further slowing efforts to stop Ebola's spread.

Undetected initially from December 2013 through March 2014, Ebola spread across Sierra Leone, Liberia, and Guinea throughout 2014 and into 2015. On August 8, 2014, WHO declared the outbreak a public health emergency of international concern.¹² By this time the virus had sickened more than 1,700 people—nearly 4 times as many people as had ever been infected in any previous Ebola outbreak.¹³ Data published by CDC around this time suggested that up to 60% of West African Ebola cases may have been unreported, reflecting serious limitations in case surveillance.¹⁴ Furthermore, because of inadequate infection control measures, healthcare workers were becoming ill, medical facilities were closing, and infected patients had nowhere to seek help. Additionally, calls for aid went unanswered, commercial airlines were canceling services, and surrounding nations threatened to close their borders.¹⁵ Guinea, Sierra Leone, and Liberia lacked the public health infrastructure required to quickly detect and respond to the outbreak.

The introduction of Ebola to Nigeria in July 2014 stands in contrast to the rapid spread of Ebola in Sierra Leone, Guinea, and Liberia. Nigeria had 2 important components in place that helped halt the spread of Ebola and resulted in only a fraction of the devastation felt by other West African countries.

First, Nigeria had more than 150 trained health professionals who were either graduates or trainees of the Nigerian Field Epidemiology and Laboratory Training Program (NFELTP). This program is modeled on CDC's longstanding applied epidemiology fellowship, the Epidemic Intelligence Service, with the addition of a laboratory surveillance component. As of September 24, 2014, these professionals had identified 894 contacts of Ebola case-patients and had performed approximately 18,500 face-to-face contact visits to monitor for signs and symptoms of Ebola virus disease.¹⁶

Second, Nigeria had established an emergency operations center (EOC) as part of the Global Polio Eradication Initiative.¹⁷ This combination allowed Nigerian health officials to respond quickly to the outbreak with trained and capable staff, working in an effective incident management system, limiting the spread of Ebola to 20 cases (19 confirmed and 1 likely) and 11 deaths in Nigeria.^{16,18}

GHSA: A Global Commitment

The global health and economic challenges resulting from Ebola reflected significant inadequacies in the surveillance infrastructure and reinforced the need for the international community to collectively implement the GHSA measures to prevent outbreaks from becoming epidemics. The GHSA is intentionally designed to be implemented collaboratively across nations with the understanding that personnel, financial, and materiel resources are not uniformly distributed across countries. Thus, strengthening the national capacity of individual countries will result in the strengthening of the global community collectively.

The GHSA specifically emphasizes the need for routine surveillance, adequate numbers of trained staff, sufficient lab facilities and resources, availability of specimen collection and transport, and deployment or development of rapid diagnostic tests and assays. Each of these components contributes to effective surveillance systems that will facilitate a rapid and comprehensive response to future outbreaks, including tasks such as case identification, contact tracing, infection control measures, and potential deployment of vaccines or other medical countermeasures.¹⁹ Establishing Field Epidemiology Training Programs (FETP) is another recommendation of the GHSA. These programs train personnel to conduct routine surveillance, including continuous monitoring and detection of public health threats and direct appropriate response activities to minimize the impact and spread of outbreaks and ensure sufficient laboratory resources to support an outbreak response.²⁰ Paired with a well-trained Field Epidemiology Training Program, an established emergency operations center is another important aspect of global health security and the GHSA. An emergency operations center sets preparations and plans in place before the event, which increases response efficacy and decreases response time. The emergency operations center model provides a defined emergency response structure, command and control functions, crucial logistic and administrative supports, and clear identification of public health leadership.²¹

The GHSA recommendations have already been tested effectively in both Vietnam and Uganda.^{22,23} Accomplishments in Vietnam included establishment of an emergency operations center staffed by personnel trained in public health emergency management, enhancement of national laboratory testing for pathogens most likely to be associated with a public health emergency of international concern (e.g., highly pathogenic avian influenza), and achievement of real-time surveillance reporting capability. In Uganda, global health security project outcomes included developing an outbreak response module that includes reporting of suspected illnesses involving priority pathogens via text messages to the Uganda District Health Information System, expanding the biologic specimen transport and laboratory reporting system, establishing and equipping a national emergency operations center, and conducting an outbreak-focused exercise in order to evaluate global health security-supported enhancements. Both pilot projects were conducted over a period of 6 months and demonstrated the feasibility of GHSA implementation. In addition, lessons were generated for future GHSA work, including the need to plan for integration within health systems, to involve and engage key leaders from the beginning of the process, and to coordinate and communicate within and between different administrative divisions and levels of government.^{22,23}

From its inception in February 2014, GHSA membership has grown to include 48 member countries.⁹ All of the member countries are committed to leading or contributing to one or more of the GHSA action packages. Guinea, Sierra Leone, and Liberia are GHSA contributing countries²⁴ and committed to supporting the GHSA through established partnerships with other countries in West and East Africa, Southeast Asia, and the Indian subcontinent to promote the establishment of global health security.¹⁵ The GHSA continues to contribute to the West Africa Ebola response. The US government has appropriated funds totaling US\$6 billion over the next 5 years to build on the lessons from Ebola. Internationally, \$1.2 billion in funding will support infection control training and education, strengthen laboratory safety and capacity, and provide workforce development programs to

train responders. In July 2015, the US government announced its intent to invest over \$1 billion in resources to expand the GHSA.²⁵

Conclusion

The aftermath and implications of the Ebola epidemic are still being felt globally. The economic and logistic challenges the world faced in confronting Ebola and its attendant humanitarian crisis will guide the GHSA. Ebola served as a cue to action for all countries and was a sobering reminder of the importance of achieving real health security. Attaining IHR compliance involves more than simply meeting a deadline; assuring functional compliance with the IHR requirements is the most effective means of preventing, detecting, and responding to global health threats and ensuring global health security equitably for all nations. We must recognize that surveillance is at the core of all public health activities and is essential to prevent, detect, and respond to health threats effectively.²⁶ The next emergence of an infectious disease threat may be surprising in its geographic, demographic, and epidemiologic particulars, but diseases will undoubtedly continue to emerge.

One of the key lessons of Ebola is that globally we are only as strong as our weakest link in the chain of surveillance. The GHSA outlines a framework for building a world in which global health security exists not just numerically in terms of countries reporting public health abilities, but functionally in the capacity to prevent outbreaks when possible, detect outbreaks early when they occur, and respond promptly and efficiently, maximizing health security and well-being both locally and globally.

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