

Assessing U.S. Community Preparedness in the Case of Ebola Virus Disease

Using Pandemic Planning for the EVD Response

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Introduction

Although only four novel cases of Ebola Virus Disease (EVD) presented in the United States in 2014 and resulted in only one fatality, public health officials recognized several problems with policies and procedures for the management of this infectious disease. Had the outbreak escalated in the U.S. to epidemic or pandemic proportions, these issues would have manifested themselves exponentially. The EVD outbreak that began in West Africa, but emerged in limited form in the United States—and our responses to it domestically—have highlighted a number of inherent vulnerabilities in the Nation’s preparedness for major infectious disease outbreaks. When a nurse in Dallas contracted the disease after treating an infected patient, it became clear that the guidelines for personal protection that previously had been issued by the Centers for Disease Control and Prevention (CDC) and the associated training were inadequate. When another nurse returning from treating patients in West Africa refused to abide by the quarantine imposed by the state of New Jersey – which like a number of other states imposed restrictions that exceeded those recommended by the CDC – the need for consistent policies and enforcement became apparent. Healthcare workers (HCWs) throughout the healthcare sector reported inadequate training regarding the use of personal protective equipment (PPE) as well as inconsistent procedures for the treatment and handling of infected patients. The lessons learned from this relatively contained outbreak will improve response capabilities for larger scale outbreaks of EVD, as well as a host of other global disease and other biological threats.

This paper highlights some of these areas, details patterns of success and failure in preparedness components, and provides recommendations for changes to procedures that could help mitigate the effects of a future outbreak.

Facts Regarding the Outbreak

The 2014 EVD outbreak was first reported in February in the West African nation of Guinea. Since then, there have been more than 26,000 cases reported worldwide resulting in more than 10,000 deaths. Ten patients have been treated in the United States, four of whom were diagnosed here. Of the four diagnosed in the United States, one patient died during treatment and the other three were released from care after demonstrating undetectable levels of virus in their blood. Two of these patients were nurses who were exposed while providing direct care to the index patient. One of these nurses was allowed to travel by plane during the time between her exposure and presentation of symptoms, potentially exposing countless others.

In addition to the leveraging of existing preparedness funds, a total of \$833 Million has been allocated by Congress to combat EVD with an additional \$5.4 billion in emergency supplemental funds to increase efforts to contain the epidemic globally, strengthen domestic preparedness, and accelerate development of vaccines and treatments.



Figure 1. Microscopic view of Ebola Zaire Virus (© Nixx Photography)

The State of Preparedness in the United States

The public health system in the United States has numerous preparedness plans and frameworks in place to help the Nation prepare for and respond to myriad pandemics and other biological threats. CDC has also published guidance documents with standard operating procedures for treating and managing patients with certain specific diseases including EVD. Yet, even with the existence of these plans and procedures, certain problems arose during the domestic response to Ebola that should be preventable.

Components of the National Preparedness Goal: Prevent, Protect, Mitigate, Respond, and Recover

The 2011 National Preparedness Goal defines five mission areas to provide the capability to prevent, protect, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk. The following are components of these mission areas that were applicable to the EVD response effort and have significant potential to improve performance in the future. Figure 2 below details the EVD management process from selection of travelers for airport screenings to discharge of an EVD patient. Decision points within the diagram are based on a determination of risk of exposure (ROE) and presentation of EVD symptoms (EVD Sx).

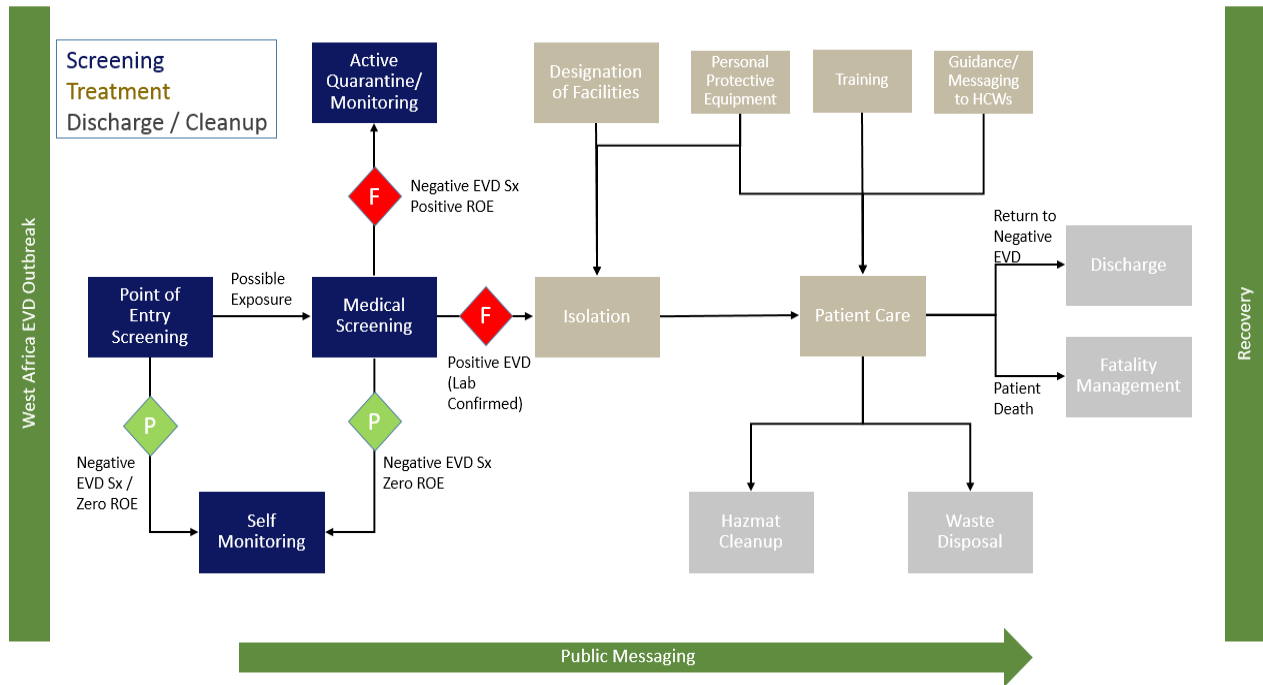


Figure 2: Components of EVD Preparedness Figure 2 details the EVD management process from selection of travelers for airport screenings to discharge of an EVD patient. Decision points within the diagram are based on a determination of risk of exposure (ROE) and presentation of EVD symptoms (EVD Sx).

- **Screening Procedures:** Screening of travelers entering the United States originating in West Africa and of patients presenting to acute care facilities is vital to identifying exposed and possibly infected people, and initiating the appropriate management and care procedures.
 - International travelers: Passengers from Ebola-affected countries are now receiving enhanced entry screening at five major U.S. airports that receive over 94% of these travelers. Customs and Border Patrol will observe for signs and symptoms and divert potentially exposed passengers to a CDC quarantine station for assessment. If further evaluation is required, travelers will be referred to the appropriate public health authority. All travelers will receive instructions for self-monitoring.

- Acute care facilities: CDC recommends that staff members screen all patients with travel histories, exposure, or clinical symptoms that might suggest the person could have EVD. Staff members should use this information to follow the “identify, isolate, and inform” strategy.
- **Designation of Facilities:** Acute healthcare facilities can serve one of three roles:
 - Frontline healthcare facilities: Most U.S. acute care facilities equipped for emergency or urgent care are considered frontline. Frontline healthcare facilities should be prepared to identify and isolate patients with potential EVD and inform the appropriate hospital and public health authorities.
 - Ebola assessment hospitals: These are hospitals equipped to care for patients under investigation for EVD until a diagnosis can be confirmed or ruled out. They should be able to provide appropriate care, including isolation and use of proper PPE by staff, for up to 96 hours.
 - Ebola treatment centers: These are facilities that care for and manage patients with confirmed EVD for the duration of illness. They must meet minimum criteria for infection control, staffing resources, PPE supplies, safety training, etc.
- **Quarantine, Monitoring, and Isolation:** Procedures for isolating and/or tracking symptoms in potentially exposed people returning from an endemic area can be highly beneficial in controlling the spread of EVD in this country.
 - Quarantine refers to the separation of an asymptomatic individual who may have been exposed to a disease from others with no exposure. A number of states have implemented quarantine procedures for all returning healthcare workers. This is not in-line with current CDC recommendations.
 - Monitoring: For potential EVD exposure, monitoring can either be active or direct active depending on the risk of exposure for a particular individual.
 - » Active monitoring requires the appropriate authority to establish regular communication with potentially exposed individuals including daily reporting of temperatures and symptoms consistent with EVD. Active monitoring is appropriate for asymptomatic individuals with low risk of exposure.
 - » Direct active monitoring requires a public health authority directly observe the individual at least once daily to review symptoms and

record temperatures. Direct active monitoring is appropriate for asymptomatic individuals with some or high risk of exposure.

- Isolation refers to the separation of an individual who is reasonable believed to be infected from those who are not infected to prevent spread of the disease. Isolation is appropriate for a symptomatic person in any risk category except zero.
- **Personal protective equipment:** Key principles for the use of appropriate PPE are: 1) HCWs should receive training and demonstrate competency in putting on and taking off (donning/doffing) of proper PPE prior to caring for EVD-infected patients; 2) HCWs should have no skin exposed during patient care; and 3) each step of donning/doffing should be supervised by a trained observer.
- **Messaging to / guidance for healthcare workers:** It is critical that the various public health authorities provide up-to-date guidance, in a timely manner, to all HCWs who will potentially have contact with EVD-infected patients. The messaging should cover all aspects of patient care, including proper PPE and infection control, and must be consistent across jurisdictions and among all sectors of the healthcare community. CDC has published specific guidance for:
 - Acute care facilities, including:
 - » Frontline healthcare facilities
 - » Ebola assessment hospitals
 - » Ebola treatment facilities
 - Emergency departments / urgent care centers
 - Emergency medical services
 - Non-acute facilities
- **Training:** In addition to readily available guidance materials, HCWs need regular training and need to exercise their acquired skills to properly prepare to treat an EVD-infected patient. Again, proper PPE donning/doffing techniques, infection control measures, and familiarity with all elements of the identity, isolate, inform strategy are critical to successful, responsible care.
- **Waste Disposal:** Waste contaminated (or suspected to be contaminated) with EVD is a Category A infectious substance regulated as a hazardous material under the U.S. Department of Transportation Hazardous Materials Regulations (HMR). For off-site com-

mercial transport of EVD-associated waste, strict compliance with the HMR is required. EVD-associated waste that has been appropriately incinerated, autoclaved, or otherwise inactivated is not infectious, does not pose a health risk, and is not considered to be regulated medical waste or a hazardous material under Federal law.

- **Hazardous Materials Cleanup:** For individuals who have confirmed cases of EVD, it will likely be necessary to decontaminate buildings that the infected person may have impacted. The U.S. Occupational Safety and Health Administration has a fact sheet, *Cleaning and Decontamination of Ebola on Surfaces*, to address precautions that need to be taken during an EVD decontamination response. Although some municipalities may have the capability to perform the decontamination, use of an experienced contractor with specialized training is considered a best practice.
- **Public Messaging:** The extreme virulent nature of EVD and the high likelihood of a fatal consequence provide ample potential for panic and extreme reactions among the population of an affected country. An unambiguous messaging strategy conveying the status of the outbreak, the actual risks involved, and definitive precautions that individuals can take will serve to allay unfounded fears and prevent negative consequences resulting from inappropriate reactions from occurring. Again, messaging must be consistent across jurisdictions and be factual, but not overly fatalistic.
- **Fatality Management:** EVD can continue to be transmitted in postmortem settings through unsafe handling of remains. Appropriate PPE is required for any handling of remains and remains should be cremated or buried in hermetically sealed caskets. Embalming should not take place and autopsies should be avoided if possible. Transportation of remains should be minimized and any interstate transport must be coordinated with the CDC.

Assessment of Successes and Failure for Components of the National Preparedness Goal During the 2014 Ebola Outbreak

Although the U. S. outbreak has thus far been limited in scope, the public health response revealed certain vulnerabilities that once addressed will enable U.S. healthcare entities to adapt and be better prepared for future outbreaks that have epidemic or pandemic potential.

We have evaluated the following areas through a review of CDC guidance and how that guidance has changed during the response, examined problems identified in the public health literature, and projected capabilities from previous disease outbreaks on epidemic and pandemic levels.

Table 1 presents a graphical representation of this assessment. A number of elements of the emergency management strategy are presented with progress indicated by the color codes identified below. Challenges and successes are also detailed.

Definitions:

RED = CHALLENGED: Denotes challenges exist that has resulted in minimal or no progress in this area.

YELLOW = PROGRESSING: Denotes progress is occurring and/or there are indicators that continued progress may be at risk unless innovative solutions and/or additional resources are allocated.

GREEN = NOTEWORTHY PROGRESS: Denotes significant on-time progress toward future milestones or that past milestones have been successfully completed.

LOCALIZED indicates that the incidence of a disease does not exceed the “expected” rate and does not spread beyond a given area.

EPIDEMIC is defined by the CDC as The occurrence of more cases of disease than expected in a given area or among a specific group of people over a particular period of time.

PANDEMIC is an epidemic occurring over a very wide area (several countries or continents) and usually affecting a large proportion of the population¹⁴.

Emergency Management Element	Demand Level	Challenges / Successes
Screening	Localized	<ul style="list-style-type: none"> Airport screening questionnaires rely on candor from foreign visitors The index patient in Dallas did not reveal that he had been with sick people in Liberia during his initial intake interview and was released (he had revealed that he had been in Africa, but not specifically West Africa, so the screener did not pass this information along)
	Epidemic	
	Pandemic	
Facilities	Localized	<ul style="list-style-type: none"> There are 48 designated Ebola Treatment Centers in the United States up from 35 in December, 2014
	Epidemic	
	Pandemic	

Emergency Management Element	Demand Level	Challenges / Successes
Isolation/ Quarantine/ Monitoring	Localized	<ul style="list-style-type: none"> ▪ 9 states and the District of Columbia have implemented mandatory 21-day quarantine for all HCWs and others returning from West Africa <ul style="list-style-type: none"> – Quarantining asymptomatic travelers and people with no known exposure is in contradiction to CDC protocols – Undermines CDC and National Institutes of Health credibility ▪ Strict quarantine measures can and have served to discourage HCWs from volunteering to assist in the affected regions ▪ Fighting epidemics requires national coordination and leadership, not ad hoc response by individuals states
	Epidemic	
	Pandemic	
PPE	Localized	<ul style="list-style-type: none"> ▪ Increased demand for PPE in West Africa has caused shortages in U.S. Hospitals ▪ As demand increases, prices for select items has gone up and there is a fear of price gouging
	Epidemic	
	Pandemic	
Guidance/ Messaging to HCWs	Localized	<ul style="list-style-type: none"> ▪ When nurses in Dallas first contracted EVD, CDC reported they must have ignored protocols <ul style="list-style-type: none"> – It was later revealed that protocols were followed, but were changing frequently and left much of the choice for PPE up to the hospital – Guidelines have since been updated to eliminate exposure of any skin while treating patients with EVD
	Epidemic	
	Pandemic	

Emergency Management Element	Demand Level	Challenges / Successes
Training	Localized	<ul style="list-style-type: none"> ▪ While many frontline facilities do have training programs in place for donning/doffing PPE, much of the training during this outbreak was done Just-In-Time ▪ Non-acute facilities have complained that no formalized training is in place for proper response if a patient presents with EVD symptoms
	Epidemic	
	Pandemic	
Waste Disposal	Localized	<ul style="list-style-type: none"> ▪ Some states have objected to having EVD-contaminated waste from neighboring states being transported across their borders
	Epidemic	
	Pandemic	
Hazmat Cleanup	Localized	<ul style="list-style-type: none"> ▪ There are very few contractors that have been willing to take on decontamination for EVD-exposed sites <ul style="list-style-type: none"> – Many states are relying on one Texas-based contractor for their decontamination efforts
	Epidemic	
	Pandemic	
Public Messaging	Localized	<ul style="list-style-type: none"> ▪ CDC has been criticized for projecting overconfidence in U.S. hospitals ability to manage EVD <ul style="list-style-type: none"> – How can they convey uncertainty without undermining perceived expertise and heightening fear? ▪ Some vendors of laboratory equipment have refused to run EVD lab tests on their equipment because they incorrectly assumed that this would contaminate the equipment and render it unusable for other testing
	Epidemic	
	Pandemic	

Emergency Management Element	Demand Level	Challenges / Successes
Fatality Management	Localized	<ul style="list-style-type: none"> ▪ The body is most contagious when the person has just died <ul style="list-style-type: none"> – Late-stage EVD infections can force blood, vomit, and diarrhea from the body ▪ As the number of fatalities increase, there will be a greater chance for lapses in infection control procedures and transmission to others

Way Forward

Lessons Learned from the EVD Response

The lessons learned from EVD present an opportunity for growth in public health and medical preparedness. The transition from a defined, international viral outbreak to a national public health event with epidemic and pandemic potential caught domestic health officials off guard. Clearly, as the United States brought an infected doctor home for treatment, increased protocols, and training for Ebola should have been simultaneously activated. While Ebola was not labeled a pandemic, the communities who spent a decade developing extensive pandemic plans should have leveraged them for the Ebola response.

The question of a “trigger” is an important one. Pandemic plans note that once there is human transmission of a new flu anywhere in the world, this will initiate a pandemic response by the United States. Noting that we all live in a global community, strategic plans assert a human outbreak anywhere means risk everywhere. This principal was not followed for Ebola and the question remains what should have triggered the enhanced activity. Ebola is not as contagious as the flu, but it is more virulent. Public health and medical officials do not have a great deal of data on how it behaves. The international community has never known a large-scale outbreak of EVD and for these reasons it appears appropriate to use the parameters set by pandemic planners.

The U.S. Ebola cases were limited, but the following are the three most relevant lessons learned from the EVD response.

Conclusion

Use the Roles, Responsibilities, and Relationships Established in Existing Pandemic Plans

Ebola is not the first novel virus to present in the United States and it does not arrive without precedent. SARS and novel influenza viruses have long since prompted state and federal officials to create extensive pandemic plans that include the National Strategy for Pandemic Influenza, pursuant Federal implementation influenza plans, and international agreements that include NAPAPI and the WHO Global Pandemic Plan. First and foremost, these plans identify the roles, responsibilities, and relationships that public health and medical officials forge in response to a large-scale public health threat. These relationships include convening pandemic working groups, enhancing reporting structures through Emergency Operations Centers (EOCs) and initiating advanced training and messaging techniques during the onset of a pandemic event. These forums were not proactively convened or utilized during the EVD response and could have served as an important collaboration point.

Communications and identification of national resources (e.g., PPE) were important issues in the Ebola response. Domestically, discussions regarding quarantine and isolation protocols (that vary state to state) and resource assessments could be conducted fairly and efficiently in the resource and logistics groups pre-designated for this role in a pandemic response. The Federal government bears increased responsibility to coordinate these relationships when several states have active cases. The nature of this national coordination is thoroughly explained in the pandemic operational and strategic plans.

Proactively Review Virus-Specific Protocols; Train and Exercise Frequently

Once Ebola reached an epidemic stage in Africa and a patient with an active case of EVD was brought to the United States for treatment, CDC and state health officials should have been on alert to retrieve Ebola or similar virus protocols and exercise them right away. Each and every pandemic plan notes CDC has the responsibility to provide updated guidance to healthcare providers on clinical management and infection control, and many note the need for immediacy citing such educational mediums as satellite broadcasts, webcasts and other real-time communication channels.

At the initiation of port-of-entry screening at five international airports, federal health officials conducted training and rehearsal of concept drills. With the recognition that Ebola could potentially be diagnosed within the U.S., CDC should have immediately reviewed and redistributed Ebola-specific guidance. State and local health officials nationwide should have conducted timely training and exercised the enhanced

procedures for healthcare workers. These preparedness steps were only taken once new cases emerged, often not reaching the frontline health workers in time.

Adapt Effective Public Messaging Strategies to Send Consistent Fact-Based Information

The HHS Pandemic Influenza Plan asserts, “An informed and responsive public is essential to minimizing the health effects of a pandemic and the resulting consequences to society.” Public information officers in every public health department must find the most effective means and methods to communicate the facts about Ebola to its particular community. These messages must be simple, fact-based and repeatable, and be disseminated in the timeliest way. There was not a clear, coordinated effort to send this message early in the Ebola response, as it would have been in a large-scale flu event, for example.

In the modern age of social media and aggressive news reporting, officials must identify the most effective medium to connect to their communities. They must rapidly send the message conveying what is happening with the virus, and what citizens should do about it in a clear, direct manner. This may include social media messaging in some areas and paper fliers in another. Local jurisdictions must be ready to act fast to address communities who may make ill-informed decisions, such as those who closed schools in response to reported staff members traveling on public transportation with suspected cases, and generally unexposed citizens purchasing several hundred dollars’ worth of PPE for themselves and their family’s unlikely use.

Further, effective messaging can not only support fact-based decisions and responsible public behavior, but support contact tracing where necessary. By allaying a community’s fear of the virus (and often the stigma), public health officials can encourage those potentially exposed to secure medical assessment and treatment.

For More Information

If you would like to receive additional information on this topic or other public health issues, please contact:

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References

1. Centers for Disease Control and Prevention. (2015, January 16). *2014 Ebola Outbreak in West Africa - Case Counts*. Retrieved from <http://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/case-counts.html>. Accessed on January 20, 2015.
2. The Trust for America's Health (TFAH) and the Robert Wood Johnson Foundation (RWJF). (2014, December). *2014 Outbreaks: Protecting Americans from Infectious Diseases*. Retrieved from <http://healthyamericans.org/assets/files/Final%20Outbreaks%202014%20Report.pdf>. Accessed on January 20, 2015.
3. CDC. *Ebola Information for Healthcare Workers and Settings*. Retrieved from <http://www.cdc.gov/vhf/ebola/hcp/index.html>. Accessed on January 16, 2015.
4. CDC. *Ebola Information for Airports*. Retrieved from <http://www.cdc.gov/vhf/ebola/airports/index.html>. Accessed on January 16, 2015.
5. CDC. *Identify, Isolate, Inform: Emergency Department Evaluation and Management for Patients under Investigation (PUIs) for Ebola Virus Disease (EVD)*. Retrieved from <http://www.cdc.gov/vhf/ebola/hcp/ed-management-patients-possible-ebola.html>. Accessed on January 16, 2015.
6. CDC. *Interim Guidance for U.S. Hospital Preparedness for Patients under Investigation or with Confirmed Ebola Virus Disease: A Framework for a Tiered Approach*. Retrieved from <http://www.cdc.gov/vhf/ebola/hcp/us-hospital-preparedness.html>. Accessed on January 16, 2015.
7. CDC. *Interim U.S. Guidance for Monitoring and Movement of Persons with Potential Ebola Virus Exposure*. Retrieved from <http://www.cdc.gov/vhf/ebola/exposure/monitoring-and-movement-of-persons-with-exposure.html>. Accessed on January 16, 2015.
8. CDC. (2014, December 10). *Procedures for Safe Handling and Management of Ebola-Associated Waste*. Retrieved from <http://www.cdc.gov/vhf/ebola/prevention/ebola-associated-waste.html>. Accessed on January 16, 2015.
9. Occupational Safety and Health Administration. *Cleaning and Decontamination of Ebola on Surfaces Guidance for Workers and Employers in Non-Healthcare/Non-Laboratory Settings*. Retrieved from <http://www.cdc.gov/vhf/ebola/prevention/ebola-associated-waste.html>. Accessed on January 16, 2015.

10. CDC. *Guidance for Safe Handling of Human Remains of Ebola Patients in U. S. Hospitals and Mortuaries*. Retrieved from <http://www.cdc.gov/vhf/ebola/hcp/guidance-safe-handling-human-remains-ebola-patients-us-hospitals-mortuaries.html>. Accessed on January 16, 2015.
11. CDC. *Epidemiology Glossary*. Retrieved from http://www.cdc.gov/reproductivehealth/Data_Stats/Glossary.htm. Accessed on January 20, 2015.