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Public Health Resilience Checklist for High Consequence Infectious Diseases – Informed by the Domestic Ebola Response in the United States

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Abstract

Objectives.—To gather lessons from the communities that responded to confirmed cases of Ebola Virus Disease (EVD) in the United States in order to inform recommendations to improve resilience to future High Consequence Infectious Disease (HCID) events.

Methods.—Key informant interviews (n=73) were conducted between February and November 2016 with individuals who participated in EVD planning or response in Atlanta, Georgia; Dallas, Texas; New York, New York; or Omaha, Nebraska. Participants represented healthcare; local, state, and federal public health; law; local and state emergency management; academia; local and national media; and local and state government. Two focus groups were then conducted in New York and Dallas, and study results were vetted with an expert advisory group. Accounts from the domestic Ebola response and recommendations for future events were used to develop an evidence-informed checklist that outlines specific actions for public health authorities.

Results.—Participants focused on a number of important areas to improve public health resilience to HCID events, including governance and leadership, communication and public trust, quarantine and the law, monitoring programs, environmental decontamination, and waste management.

Conclusions.—The direct experiences of select jurisdictions recently engaged in EVD response provided a rare opportunity for collective learning and the development of a concrete list of actions with which to strengthen of public health resilience to future HCID events.

Introduction

During the 2014–2016 West Africa Ebola epidemic, patients with Ebola Virus Disease (EVD) were treated in five US communities.^{1,2,3,4,5} These communities represent the few locales that have experienced an active response to a high-consequence infectious disease (HCID) event in the US. Although infectious disease events vary and present unique

challenges, the lessons learned from the domestic response to confirmed EVD cases may improve preparedness and increase resilience to future HCIDs.

Beginning in August 2014, a total of eleven cases of EVD were treated in the US. The first two patients were diagnosed overseas and returned to the US for treatment in a specialized treatment and containment facility at Emory University Hospital in Atlanta, Georgia.³ Additional repatriated patients were later treated at Emory; the University of Nebraska Medical Center in Omaha, Nebraska; and the National Institutes of Health Clinical Center in Bethesda, Maryland.^{4,5} These facilities maintained specialized containment facilities established years previously. They provided treatment and supportive care since the patients they received were diagnosed elsewhere.

Two other communities—Dallas, Texas and New York, New York—treated patients that were diagnosed locally. Texas Health Presbyterian Hospital Dallas was the first medical facility to treat a previously unidentified case of EVD.¹ As a result, this community dealt with a number of emergent issues and mistakes that provided important lessons for the future. Although Dallas received some criticism from the media and public, the community responded well in many ways. NYC Health + Hospitals/Bellevue treated a patient who provided medical care to EVD patients in West Africa. Upon his return to the United States, he self-monitored for EVD symptoms, and he informed health authorities immediately upon registering a fever.² Bellevue developed a Special Pathogens Unit (SPU) in preparation for the potential arrival of an EVD case in New York, but it did not have a purpose-built biocontainment unit.⁶

Together, members of the health sector in these responding communities provide a unique perspective on the limited examples of resilience – that is, the ability to withstand, recover from, and evolve – in the face of HCIDs. This research was intended to gather important lessons from the communities that responded to confirmed cases of EVD and draw out recommendations for future HCID events. These recommendations have been developed into an evidence-informed checklist that outlines specific actions for public health authorities, in partnership with government, non-governmental organizations, medical facilities, private industry, and other stakeholders, to strengthen resilience to HCID events. They are intended to complement, not replace, existing guidance developed and issued by the U.S. Centers for Disease Control and Prevention (CDC).⁷ This paper focuses on resilience of the public health sector and directly related entities only.

Methods

An initial background review of available literature—including traditional media, after action reports, and peer-reviewed literature—was performed to orient the research, identify prospective interview participants, and inform interview themes (e.g., risk perception; healthcare; and local, state and federal response).⁸ Key informant interviews were conducted between February and November 2016. Inclusion criteria were: participation in EVD planning or response in Atlanta, Georgia; Dallas, Texas; New York, New York; or Omaha, Nebraska. Participants represented healthcare; local, state, and federal public health (including CDC and Federal Bureau of Prisons); law; local and state emergency

management; academia; local and national media; and local and state government in communities that responded to confirmed cases of EVD. After identifying an initial set of interviewees, snowball sampling expanded the sample. A total of 73 individuals (Atlanta – 17, Dallas – 22, New York – 13, Omaha 18, CDC – 3) were interviewed via telephone (Figure 1). A semi-structured interview outline was developed based on literature and prior knowledge of the research team. Interviews were recorded, transcribed, and qualitatively coded using NVivo.⁹ Additionally, two focus groups were conducted in Dallas and New York in December 2016 and January 2017, respectively, to investigate themes from each locale. Study results were vetted by an expert advisory group, assembled in January 2017, consisting of infectious disease subject matter experts and select study participants. Participants offered a range of comments, including accounts from the EVD response and recommendations for future events. Results from each phase of the study were used to inform recommendations.

This research was designated “exempt” under §45 CFR 46.101(b)(2) by the University of Pittsburgh IRB and determined to be “non research” by the CDC Human Research Protection Office. This study was supported by federal funding through contract 200-2015-M-87759 “Health Sector Resilience Checklist for Highly Infectious Diseases.” Study findings related to healthcare and emergency medical services (EMS) are described elsewhere.

Findings

Governance and Leadership

Response to an infectious disease outbreak is greatly influenced by the governance structure of a specific municipality or state and these differences often determine lines of authority and responsibility. Across all four communities, participants noted that the response chain of command (e.g., via the Incident Command System [ICS]), with a single designated leader at each level (e.g., facility, local, state) was critically important to ensure that responders, the public, and the media knew who was in charge.

Participants stressed that senior local government officials should be prepared to play a visible role in the response even if they are not the Incident Commander. The personal relationships, influence, and understanding of available resources that these individuals can contribute to the response are invaluable. Further highlighted as an important ingredient for success was a clear understanding of relevant federal, state, and local roles that ensures the inclusion and integration of all stakeholders, including public health, in a unified cross-sectoral response effort.

Communication and Public Trust

Public trust is key to a successful infectious disease response, but it can be easily lost due to poor communication. Many participants noted that fear of the unknown, particularly when coupled with changing or conflicting information, may trigger unintended responses from the public. The political, social media, traditional media, and social environment in which the domestic Ebola response occurred required robust information campaigns and

public outreach by trusted and influential community leaders and experts to mitigate acute fear and stigmatization of some affected populations (e.g., patients, clinical staff and their families). Participants commented that efforts to communicate transparently and build trust were important in improving the response, even if not always completely successful.

The most effective responses involved organizations and officials who had built up stores of public trust through “good neighbor” policies in advance of the event and thus could retain public confidence and receive the benefit of the doubt by the community. For instance, two of the studied facilities with biocontainment units had engaged the local community and media prior to the Ebola response and, as a result of this prior open relationship, enjoyed better support during the response.

Programs Monitoring Potentially Affected Individuals

Due to the pathology, symptomology, and epidemiology of EVD, many individuals identified as being at risk for exposure to Ebolavirus were monitored by public health for the onset of EVD symptoms and to reduce the need for quarantining these individuals. Many study participants reflected on the fact that the monitoring programs used during the domestic Ebola response required extensive resources to implement and would likely be a tremendous burden in future HCID events in which they were utilized. Although these endeavors may reduce the need for quarantine, they are time consuming and difficult, requiring the effort of many individuals who may have other responsibilities, especially during a large-scale infectious disease event. Participants noted that although funding restrictions often limit the number of staff that can be made available for monitoring and for a larger public health response, surge capacity is vital.

Successful monitoring programs require the development of a relationship between public health and the person under monitoring. Study participants noted that initial face-to-face meetings facilitated the development of trusted relationships and provided an opportunity for public health officials to explain monitoring requirements and for monitored individuals to ask questions. Although this is an appropriate and beneficial approach for successful monitoring, participants explicitly noted the incredible burden this process placed on their limited time and resources.

Some individuals under monitoring may require assistance to participate in required check-in activities. While cell phones provided to monitored individuals during the domestic Ebola response were costly—and may have been unnecessary for some—many individuals under monitoring, particularly those without a strong local network of family and friends, needed this resource to successfully report to local public health authorities. Study participants cited online systems, phone applications, video chats (e.g., Skype and FaceTime), and other technology-enabled monitoring systems as ways to reduce the workload on public health; however, these may require additional investments (e.g., purchasing or developing a system) including staff time to learn and manage the system. In addition, these mechanisms can limit intrusion on monitored individuals’ lives and provide them with a sense of greater control. Safeguards are required to ensure data security, particularly for medical data and personally identifiable information, and prevent false reporting of data by monitored individuals.

Study participants noted that monitoring programs during the domestic Ebola response required significant coordination with federal partners and neighboring jurisdictions. Travelers crossing into and between jurisdictions required local, state, and federal authorities to coordinate closely to identify monitored individuals and transfer appropriate data and responsibility. Furthermore, monitored individuals occasionally reside outside of a typical community setting (e.g., homeless and incarcerated populations), requiring coordination with a variety of non-traditional public health partners. For instance, incarcerated individuals that required monitoring posed unique challenges due to their prolonged close contact with others, potential lack of cooperation by inmates, limited on-site clinical and isolation capabilities, and requirements for patient escort (potentially including armed escort). Additionally, corrections officers have little or no training in infection control practices, and they may be unwilling to interact with monitored or symptomatic individuals. Close coordination with local EMS and healthcare facilities was also needed to facilitate transfer to appropriate medical facilities as necessary.

Quarantine and the Law

During the domestic Ebola response, quarantine was occasionally used in an attempt to reduce potential risks to the public. Public health laws are the foundation for quarantine and isolation orders, but these laws are complex and differ between jurisdictions.¹⁰ Participants highlighted the importance of understanding the scope and limitations as well as the processes and mechanisms for implementing and enforcing these laws prior to the onset of an event. Furthermore, careful consultation with legal experts may be required to identify potential areas for legal challenge and ensure that existing legislation will withstand legal scrutiny.

Several participants commented on the importance of due process with respect to quarantine activities and explicitly noted that caution should be taken to avoid unnecessarily infringing on individuals' civil rights. Although public health provided a range of support services, several participants indicated that it was difficult for quarantined individuals to challenge quarantine orders expeditiously. Participants noted the need for legal expertise, both to support public officials in the implementation and enforcement of quarantine laws and policies and to ensure appropriate legal counsel is available to quarantined individuals. This counsel can protect the rights of affected individuals throughout the quarantine process and ensure they are afforded due process, including their right to challenge issued orders.

Participants also noted that scalability is a major challenge for quarantine operations. The provision of services may be manageable when overseeing the quarantine of a few individuals, but they may quickly exceed local capacity as a greater number of individuals are placed under quarantine. Study participants noted that public health officials often assumed responsibility for the care of affected individuals while in quarantine. Individuals subject to quarantine require food and drink, clothing (appropriate for varying religions and personal needs), shelter, privacy and security, the ability to communicate with family and friends, and mental health support, and they may additionally require clinical care for unrelated medical conditions, recuperation of lost wages, assistance with child/elder/pet care, and/or legal counsel.

Interviewees also indicated that the use of quarantine requires coordinated planning and response across multiple entities outside the traditional scope of public health. For instance, local law enforcement was often required to provide security, both to ensure compliance with quarantine orders and protect individuals under quarantine. Additionally, coordination with EMS and the healthcare system was also necessary in the event that a quarantined individual became symptomatic and required transport to a treatment or assessment facility.

Several study participants described the use of “voluntary” quarantine as a means of avoiding the use of mandatory quarantine orders. While this may expedite and simplify quarantine processes for public health officials and model a cooperative approach to epidemic control, some drawbacks were noted. For instance, some degree of coercion or duress may be implicit in offering individuals a choice between “voluntary” quarantine or a mandatory quarantine order. In addition, one quarantined participant noted that for an individual who consents to voluntary quarantine but later believes the quarantine to be unjust, the process by which to challenge the “voluntary” quarantine without significant stigma and public backlash is unclear.

Environmental Decontamination

Environmental decontamination of buildings and objects that had potentially been contaminated with Ebolavirus also proved difficult for public health during the domestic Ebola response. Participants noted that in situations where scientific evidence surrounding transmission and safety may not be clear, expenditures on decontamination can become extraordinary and the number of willing and decontamination-qualified contractors scarce. They highlighted the importance of pre-event planning, recognizing that authorities and contractors must continually seek out the authoritative guidance for different pathogens and be alert for potentially changing guidance during an event.

Many participants commented that the decision to engage in decontamination activities should be based on scientific evidence and that overly aggressive actions taken “out of an abundance of caution” can undermine science-based policies in the rest of the response. For example, private citizens and business owners may engage in additional decontamination efforts on their own, but public health and government should not take responsibility for activities that go beyond decontamination efforts supported by science.

Waste Management

During the domestic Ebola response, participants highlighted waste management as one of the most vexing and difficult problems to overcome. Care for patients with a HCID may potentially generate enormous amounts of hazardous sewage and solid waste. Participants noted that although hospital facilities have a primary role in determining how to manage this waste, public health may play an important role in planning for waste handling, transportation, and storage. When interstate transportation of waste was required, multiple states, the Environmental Protection Agency, and other organizations needed to be involved to coordinate response operations. In the case of the Ebola response, communicating about these plans, including hospital wastewater sanitation, with the media and the public was necessary to address public fears.

Discussion

This research was performed to inform the development of a resilience checklist for state and local public health entities with responsibility for preparedness and response to a HCID event.⁸ Checklist recommendations relevant to public health are described below.

Governance and Leadership

- Identify a single leader early in a response to a HCID event.
- Use the ICS command structure across the response.
- Ensure that the roles and authorities of various agencies at the federal, state, and local level as well as the ICS structure for the jurisdiction and/or state during an infectious disease event are well understood. Authorities may change under various types of emergency declarations.
- Establish and continually strengthen collaborative relationships with partner organizations such as healthcare facilities and other public health agencies.
- Understand relevant public health and safety responsibilities and authorities for various agencies and organizations within the jurisdiction.

Communication and Public Trust

- Train risk communicators with a background in communication science to develop and deliver effective, clear, consistent, transparent, and honest messages to the public and stakeholders.
- Anticipate the need for and establish relationships to coordinate messages between healthcare and local/state public health entities.
- Educate the media, public, and elected officials about HCID preparedness and response activities and policies.
- Conduct regular engagement activities with community stakeholders (eg, community and faith based organizations, local opinion leaders) to address community needs, build public trust and establish partnerships ahead of an event.
- Communication plans should include multiple communication approaches—including town hall meetings, social media, guest spokespersons, and telephone information lines—to disseminate information quickly and provide the opportunity for two-way communication with the public.
- Establish procedures and personnel to monitor social media and other community links to identify and rapidly respond to rumors and misinformation.

Quarantine and the Law

- Understand the scope and limitations of public health laws, policies, and authorities. Consult legal experts when necessary.

- Establish clear, practical, and evidence-based policies for quarantine and isolation that minimize infringement on civil rights to the extent possible while still effectively protecting the health of the public.
- Quarantine plans should accommodate the needs of special populations and address a range of required services, including legal counsel and expeditious due process; clinical care; religiously or personally appropriate food, drink, and clothing; mental health support; adequate shelter; recuperation of lost wages; care for children/elders/pets; and communication with family and friends.
- Coordinate with local law enforcement to ensure that plans for quarantine and isolation are aligned.

Monitoring

- Implement clear, consistent, science-based, and practical guidelines for monitoring potentially affected individuals that are capable of accommodating the needs of special populations such as children, homeless persons, mentally or physically challenged individuals, non-English speakers, and incarcerated individuals.
- Identify monitoring personnel and ensure sufficient surge capacity, including capacity to track resources and personnel time for potential reimbursement.
- Consider and implement technological improvements to monitoring systems, as appropriate.
- Establish protocols with healthcare facilities and EMS for transport and care of monitored individuals

Environmental Decontamination

- Public health and decontamination contractors should seek authoritative guidance on decontamination requirements for a range of pathogens before an event occurs and should be prepared to adapt processes based on newly emerging information.
- Identify secondary decontamination-qualified contractors to replace primary contractors who may wish to withdraw their participation.

Waste Management

- Establish plans for handling, transportation, and storage of hazardous waste. If interstate transportation of waste is required, prepare to coordinate with multiple states, the EPA, and other relevant agencies.
- Plan to communicate with the media and public about waste management in order to alleviate public fears.

Limitations

Although efforts were made to ensure robust and generalizable results, included locales may not be representative of other settings. Additionally, the period of time (1–2 years) between events of interest and research interviews may introduce recall bias. Furthermore, the study sample was designed to achieve a range of differing viewpoints but not a statistically representative sample of those involved in the domestic Ebola response. Participants were skewed towards high profile responders, identified through our literature review; however, snowball sampling helped to expand the sample. Finally, recommendations target improving preparedness for a HCID event at the state and local level; additional federal activities are beyond the study scope.

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Public Health Implications

This research provides a unique perspective on the limited examples of resilience in the face of HCIDs and identifies important lessons from the communities that responded to confirmed cases of EVD. Recommendations for future HCIDs have been developed into an evidence-informed checklist that outlines specific actions to strengthen resilience to HCIDs. As preparedness for future encounters with HCIDs continues, these findings, recommendations, and checklist will help public health entities improve response activities and avoid potential pitfalls during future responses.

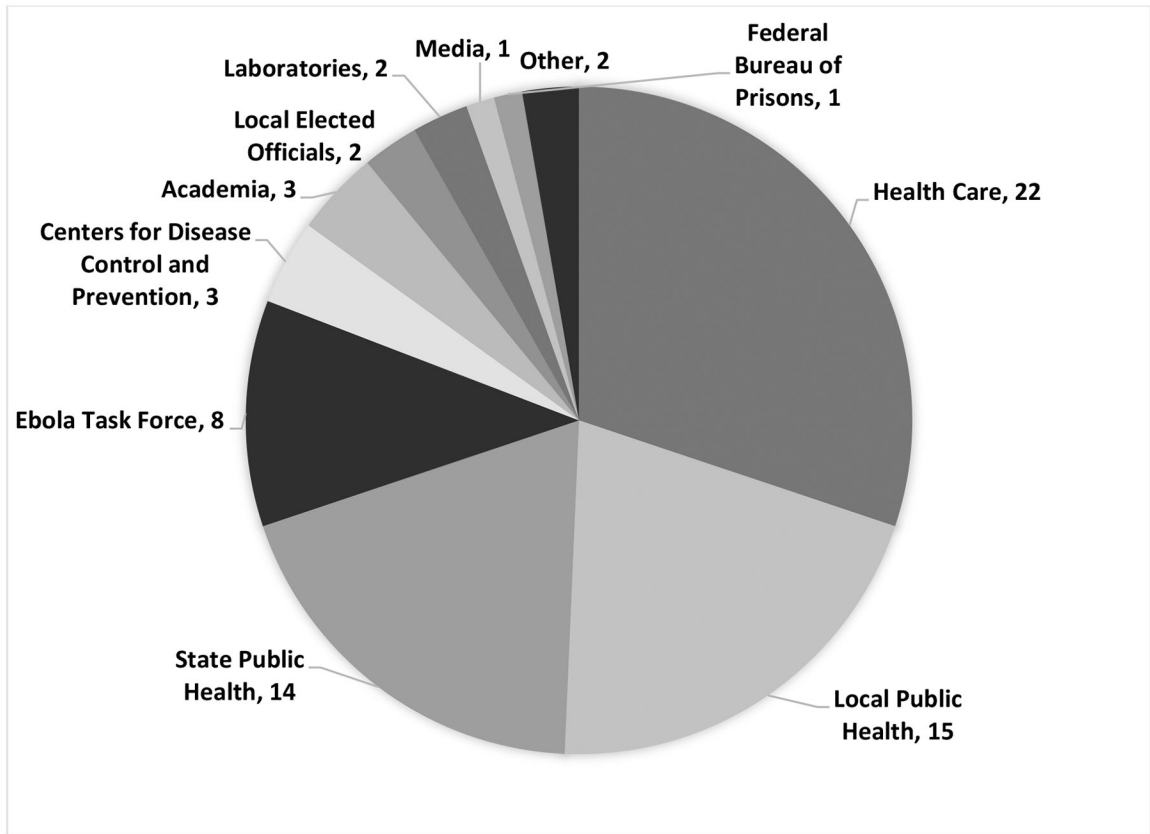


Figure 1.
Key Informant Interviewees by Area of Expertise, n=73