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Preparedness and Response to Public Health Threats: How Ready Are We?

Introduction

On September 30, 2014, the Department of State Health Services (DSHS) Laboratory and Centers for Disease Control and Prevention (CDC) tested a specimen for Ebola virus, and found it positive. Mr. Thomas Duncan was the first Ebola patient to be diagnosed in the country; he passed away on October 8, 2014. Two secondary cases of Ebola occurred in nurses who directly cared for Mr. Duncan, and both nurses are now recovered. From September 30, 2014, to November 7, 2014, Texas public health monitored 177 individuals who had varying risks of exposure to the virus, and additional individuals were monitored due to potential exposure on two airplane flights. No secondary cases resulted from community exposure. The strengths of the public health system allowed Texas to contain the spread of Ebola in Dallas – state, local and federal partners working collaboratively with a single purpose, to protect the health of Texans.

Conclusion of this event now allows a systematic review of response efforts to take place. In Texas, this will occur through an after action review process, which engages input from local, state, and federal responders who were part of the effort, and analyzes each part of the response. The assessment will determine what worked, what can be improved, and how those improvements can be made. The final result will be enhanced preparedness plans for future infectious disease events.

Although this assessment is ongoing, certain themes are emerging that speak to the need for a broader conversation about the nation's public health response capacity for infectious disease. The Ebola outbreak in West Africa continues to pose a risk worldwide. Other diseases with risk of importation to the United States require a stable, robust public health infrastructure: extremely drug resistant Tuberculosis; measles; dengue fever; SARS (severe acute respiratory syndrome); Middle East Respiratory Syndrome (MERS); Lassa fever; and highly pathogenic influenza.

To facilitate a broader assessment of the public health response system in Texas, Governor Rick Perry has created a task force composed of 17 members with infectious disease, crisis management, and other areas of expertise. The purpose of the Task Force on Infectious Disease Preparedness and Response is to assess and enhance the state's capability to respond to outbreak situations. Texas' work in this regard would be complemented by a similar effort on a national scale. As has been abundantly evident in the past months, infectious disease response requires intense coordination and preparedness throughout the national public health system. Cohesive response also requires integration across agencies, health care systems, sector types, and differing organizational missions. A national discussion among experts of varied backgrounds, responsibilities, and levels of government has the potential to better prepare the entire country to quickly and effectively stand up in response to the next infectious disease event.

Infectious Disease Surveillance in Texas

For purposes of public health, the State of Texas is divided into eight health service regions. In areas where a local health department exists, DSHS health service regional offices provide supplemental or supporting public health services. In areas where there is no local health department or local health authority, DSHS health service regional offices act as the local health authority and may provide core public health services.

Local health departments are of varying size, resources, and capacities. While some health departments support a full array of services, others have more limited functions. Approximately 60 health departments in Texas are “full service,” while 80 offer fewer services. DSHS’ role is to fill in, as needed, core public health services not offered at the local level.

For infectious disease, DSHS health service regions ensure that disease surveillance occurs in every Texas county through the continual and systematic collection, analysis, and interpretation of health data. This effort is dependent on disease reporting by providers, which is required by law. Currently, in Texas, over 60 conditions are subject to mandatory reporting, including: foodborne, vector-borne, respiratory, and sexually transmitted diseases. Viral Hemorrhagic Fever, including Ebola, is an immediately-reportable disease in Texas.

In order to allow real-time monitoring of disease surveillance data, the Centers for Disease Control and Prevention (CDC) provides and maintains the National Electronic Disease Surveillance Network (NEDSS) for use by local, regional and state health departments. NEDSS is used by nearly every local health department in the state, and allows DSHS to identify unusual increases or pattern shifts in disease numbers.

In concert with NEDSS, Electronic Laboratory Reporting (ELR) has improved the timeliness and comprehensiveness of diseases reporting. ELR electronically links laboratory test reports to NEDSS, allowing immediate access by DSHS or the local health department with legal jurisdiction.

Infectious Disease Investigation and Response in Texas

Timely disease reporting to the public health system is imperative for quick mobilization of public health investigation and response efforts. Since Texas is a home rule state, epidemiological investigations begin at the local level, unless there is no local health department. While local entities have the statutory responsibility to lead infectious disease investigations, state and CDC guidance is available and widely used.

More complicated or widespread events can increase the state and federal roles. If an outbreak involves multiple jurisdictions, the state role becomes more prominent. If, at any time, an investigation goes beyond local capabilities, the state may take the lead. In turn, if an investigation exceeds state resources, the state may ask the CDC for assistance. Additionally, the CDC leads multi-state investigations. No matter the level of outbreak, the expectation is for all three levels of government to work in cooperation, with varying levels of state and federal

involvement depending on the size and type of infectious disease event, and the resources and expertise of the local entity.

Support provided by the state and CDC can include a number of options, depending on the scope of an investigation and local needs. This support might consist of subject matter expertise and onsite assistance; state or CDC laboratory testing; provision of personal protection equipment; or mobilizing of DSHS Rapid Assessment Teams or CDC Epi-Aids. The state and CDC can also assist with administering questionnaires and interviews to cases and potential contacts, inspecting relevant hospital facilities or restaurants, and helping examine pertinent records.

In cases of large-scale outbreaks, an incident command structure may be activated at the local and state levels. DSHS maintains the State Medical Operations Center (SMOC), which is the medical arm of Texas' emergency operations command and control facility, the State Operations Center (SOC). The SMOC's function is to ease the flow of information among multiple jurisdictions, provide dependable tracking of events, and facilitate requests for resources and supplies from local jurisdictions.

Successful Infectious Disease Response in Texas

The public health response system in Texas, led by local entities and supported by state and federal government, has a long history of successful outbreak responses. Texas has effectively contained events involving disease like Tuberculosis, measles, hepatitis, and salmonella.

While the Ebola response was ongoing in Dallas, DSHS disease investigators were concurrently involved in an infectious disease outbreak of a much wider scale. In concert with the local health authority in El Paso, Texas, DSHS tracked a number of exposures to Tuberculosis (TB) that occurred through a health care worker in the labor and delivery unit of a local hospital. This situation is a prime example of how, under the current system, all levels of government successfully work together to respond to an infectious disease event.

Once the index case was identified, local and state health department investigators meticulously examined hospital records to determine infants, parents, coworkers, and volunteers who were at risk of exposure. This investigation identified an initial 3,227 potentially-exposed newborns, and 69 potentially-exposed health care workers. Together, public health workers evaluated the index case's history to determine where exposure may have actually occurred. Then, they prioritized potential contacts by level of risk, decided on a contact investigation protocol specific to this incident, and executed the contact investigation. The CDC provided on-site assistance, and home office CDC staff provided expertise and advice. International coordination took place due to the city's proximity to the U.S.-Mexico Border; interstate coordination with New Mexico was also necessary.

Public health investigators were able to narrow down the initial 3,227 number to 940 exposure contacts: 860 infants, 69 healthcare workers, and 11 community contacts. Of these exposures, four babies and four adults were positive for TB infection. Appropriate public health follow-up and treatment recommendations are underway for all eight.

Public Health Emergency Preparedness Funds and Hospital Preparedness in Texas

Texas experiences several challenges in public health and health care preparedness planning. The state's large size and population, diverse geography, weather patterns, coastal area, and border proximity necessitate coordinated preparedness planning. Historically, Texas has had more federal disaster declarations than any other state, with 88 major disaster declarations between 1953 and 2013. These declarations have included floods, hurricanes, tropical storms, tornadoes, droughts, wildfires, and explosions.

These challenges have necessitated a strong focus on preparedness planning for the state. Emergency planning in Texas takes an all-hazards approach to preparedness and response, which includes natural events, biological events, hazardous material spills, radiological accidents, terrorist acts, and others. Each type of incident requires development of response plans, periodic training, and continuous improvement.

Two key federal funding streams support Texas activities in this area: the U.S. Health and Human Services (HHS) Hospital Preparedness Program (HPP), which is administered by the Office of the Assistant Secretary for Preparedness and Response (ASPR), and the Centers for Disease Control and Prevention (CDC) Public Health Emergency Preparedness (PHEP) program. The HPP provides resources to help hospitals and healthcare stakeholders prepare for and respond to bioterrorism and medical emergencies with a primary focus on coalition building. PHEP funds are used to increase state, regional, and local public health capacity for a flexible, all-hazards approach to emergency preparedness.

HPP and PHEP funds have allowed Texas to successfully respond to a broad array of incidents over the years. Since 2008, Texas has carried out effective response efforts in natural events like Hurricane Ike and Dolly, as well as the Bastrop wildfires; disasters like the West, Texas Fertilizer explosion; disease outbreaks including West Nile Virus, the H1N1 pandemic, Tuberculosis, Salmonella, and cyclospora; and other events like the Yearning for Zion Ranch compound.

The trends in funding for these preparedness activities are aligned with the major events of the time. The attack on the World Trade Center on 9/11 infused the system with support. Avian influenza in 2007 and H1N1 in 2010 resulted in additional support. However, since that time, HPP awards to Texas has consistently decreased from \$33.3 million in fiscal year 2004 to an anticipated \$15.8 million in fiscal year 2015. PHEP awards to Texas have similarly declined since 2002, a situation that does not allow Texas to fully keep up with rising costs and the need to continually prepare. Consistency at sustainable levels would better allow states to prudently plan preparedness and response activities.

Lessons Learned: Ebola and Infectious Disease

As with every response, the events in Dallas have provided lessons that must inform future preparedness and response activities. The lessons are augmented by experiences in other states that have received patients, managed potential contacts, and are trying to plan for the possibility of an Ebola suspect or known case within their jurisdiction.

Certain lessons were immediately apparent in Dallas, and confirmed previous knowledge. The crux of infectious disease response is reporting. Providers must be aware of what diseases are reportable to their local health department, and promptly report contagious disease through the reporting system. Provider awareness of this responsibility allows for more effective disease surveillance, and more timely response to developing infectious disease events.

Secondly, the Ebola cases in Dallas highlighted the need for providers to vigilantly take travel histories, and streamline sharing of this information while a patient is being diagnosed. Providers must be aware of outbreaks worldwide, to inform their consideration of patient travel history. Until the Ebola outbreak in West Africa is over, Ebola must be a differential diagnosis for those who have recently traveled from one of the outbreak countries. At the same time, moving forward, providers must be aware of what other outbreaks are occurring internationally.

Other lessons were arrived at through the provision of care for a late-stage Ebola patient. Two months ago, the national strategy was that any community hospital should be able to care for an Ebola patient. Treating Mr. Duncan shows how labor intensive care for a patient with Ebola is, the meticulous detail required to avoid secondary infections, and the amount of resources needed to prevent the spread of virus. Now, it is apparent that a nationwide network of predefined infectious disease treatment centers is needed for the care of patients with high consequence infectious diseases like Ebola. These treatment facilities must have a care team identified and carefully trained; a comprehensive plan for care, laboratory testing, waste disposal, patient transport; and mortuary services; pre-stocked medicines and post exposure prophylaxis (PEP); and a sufficient supply of personal protective equipment (PPE). In Texas, two facilities are prepared to treat patients with Ebola under short notice, and additional capacity is being identified.

The care of Ebola patients also informed the need to modify PPE and other Ebola-related guidelines. The overall lesson is that guidelines must be consistently reviewed and updated to ensure the smooth and safe care of infectious disease suspect and known cases, from beginning to end. Additionally, access to experimental therapeutics and PEP must be expedited and more flexible, and there must be an intensified focus on testing and producing Ebola vaccine and treatment drugs.

The epidemiological process of identifying, isolating, and diagnosing individuals for Ebola revealed its own lessons. The Lab Response Network (LRN), which receives support through PHEP funds, has been critical. The Texas State Public Health Laboratory is part of the LRN and had fortunately become certified to test for Ebola just before Mr. Duncan was identified as a possible Ebola case. The LRN must be robust nationwide to ensure that testing capacity adequately covers the nation.

A number of lessons have arisen with regard to monitoring and potential quarantine of numerous individuals. The language surrounding this process and the correlation between risk and public health action must be clearly delineated. This precision will help provide the public assurance that decisions are based on science, and to provide public health and government officials clear information by which to make decisions about contact monitoring and quarantine.

Moreover, government action regarding voluntary compliance guidelines and mandatory quarantine orders must occur in a manner that respects individual freedoms, and ensures necessary supports are provided to individuals who are asked to refrain from entering public venues. Concerns over employment, education, transportation, housing, and simple household issues such as groceries impact the willingness of individuals to comply with voluntary and mandated quarantine orders. Challenges have also emerged as asymptomatic persons under monitoring seek medical treatment for issues unrelated to Ebola, as public health looked for housing for individuals of quarantine, and officials negotiated waste management issues requiring coordination among multiple agencies.

Finally, the efforts of Texas and other states to prepare for the potential of an Ebola suspect or known case inform potential improvements for infectious disease response. Hospital, local, and state ability to access PPE supplies has become problematic. There is a gap in knowledge about what hospitals should have on hand and how to proceed if they are unable to purchase appropriate PPE. For states, a challenge exists in stockpiling and warehousing adequate PPE to be able to respond to surge situations, while ensuring that caches are on a rotation basis to avoid PPE expiration without use. Furthermore, while guidelines regarding airport screening and travel have been an area of focus, there appears to be a need to further refine maritime guidelines.

Identified Issues: All Hazards Events

The Dallas response exhibited particular needs associated with a biological event like Ebola. A response to a natural disaster involves mobilizing resources, managing finite supplies, transporting equipment and personnel, and providing established medical and social care. On the other hand, biological events like the Ebola response have fundamentally different characteristics from other emergency events. In Dallas, a greater focus was on less tangible activities, including: patient screening and isolation; epidemiological surveillance; management and sharing of epidemiological data; expert medical and public health decision making; legal resources, and coordination of multiple jurisdictions and agencies.

Despite these differences, all types of emergency response events require a level of training, communication, and leadership that is universal. The incident command structure (ICS) is a tool that brings public health, law enforcement, emergency management, and other essential functions together into a coordinated response effort. The incident command structure also helps ensure that three levels of government work together seamlessly, provides overall direction for the response effort, and ensures clear and accurate communication with the public. The ICS is essential, and must be consistently practiced in order to ensure effective execution in the event of an emergency response.

The ICS should integrate each participant into its structure, so that there is a clearly-delineated chain of command, and no question about the role of each jurisdiction. Defined roles and responsibilities for each individual within the ICS ensure that multijurisdictional responses work with a shared vision and purpose, and help avoid potential cross-agency issues. These structural decisions, however, must be largely outlined before a response occurs. Tabletop and active

exercises allow emergency management and public health planners to simulate these crucial decisions, and be more effective when an emergency becomes a reality.

Throughout a response, quality improvement must be a priority. Within the ICS, at least one individual should be designated to record events and identify issues that should be looked at more deeply once the response comes to an end. Only by beginning the learning process during a response will jurisdictions be able to maximize after action processes that inform better response in the future.

Conclusion

The response to Ebola in Dallas, Texas, exhibited the strength of public health processes. No secondary cases of Ebola resulted from community exposure. The two secondary cases that occurred were associated with direct care by health care workers of an Ebola patient. Quick identification of these cases allowed more immediate care, fast isolation of the patients, and a better chance for successful health outcomes.

At the same time, the response brought issues to light that can be improved. In Texas, the Task Force on Infectious Disease Preparedness and Response is examining the state's entire public health response system for infectious disease. The Task Force's work will undoubtedly result in a more ready Texas, whether the next event be another Ebola case or another, more infectious, disease. However, Texas represents just one part of a nation that must work together to respond to diseases that cross county and state lines. Just as the Texas Task Force is looking at these issues within its jurisdiction, national consideration of the country's public health response system should take place to ensure a more ready United States.