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## Establishing a Hospital Response Network Among Children's Hospitals

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### Abstract

A timely and effective response to public health threats requires a broad-reaching infrastructure. Children's hospitals are focused on evaluating and managing some of the most vulnerable patients and thus have unique preparedness and response planning needs. A virtual forum was established specifically for children's hospitals during the 2014–15 Ebola outbreak, and it demonstrated the importance and utility of connecting these specialty hospitals to discuss their shared concerns. Developing a successful children's hospital response network could build the national infrastructure for addressing children's needs in preparedness and response and for enhancing preparedness and response to high-consequence pathogens. Using the Laboratory Response Network and tiered-hospital network as models, a network of children's hospitals could work together, and with government and nongovernment partners, to establish and refine best practices for treating children with pathogens of public health concern. This network could more evenly distribute hospital readiness and tertiary pediatric patient care capabilities for highly infectious diseases across the country, thus reducing the need to transport pediatric patients across the country and increasing the national capacity to care for children infected with high-consequence pathogens.

### Keywords

Pediatrics; Hospital preparedness/response; Public health emergency preparedness/response

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Public health threats can emerge anywhere at any time, and timely and effective response requires a broad-reaching infrastructure. This was successfully demonstrated through the development of the Laboratory Response Network (LRN) in 1999, which increased national

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capacity to identify threats, and through the development of a network of hospitals during the 2014–15 Ebola outbreak, which improved national capacity to care for patients infected with a high-consequence pathogen. The success of these networks is in part due to the development and use of consistent standards and protocols, efficient communication, and pre-positioning of resources.

Children's hospitals are focused on the evaluation and management of some of the most vulnerable patients, as children have unique physiologic, developmental, and social characteristics that require special consideration, particularly in public health emergency settings.<sup>1,2</sup> As a consequence, children's hospitals have unique needs in preparedness and response planning. A virtual forum established specifically for children's hospitals during the 2014–15 Ebola outbreak demonstrated the importance and usefulness of connecting these specialty hospitals to discuss their shared concerns. Developing a successful children's hospital response network would build national infrastructure for addressing the needs of children in preparedness and response and enhance preparedness for and response to high-consequence pathogens. By using the successful characteristics identified in the LRN and tiered-hospital network, a network of children's hospitals could work with each other, and with government and nongovernment partners, to establish and refine best practices for treating children with pathogens of public health concern. This network could more evenly distribute hospital readiness and tertiary pediatric patient care capabilities for highly infectious diseases across the country, reducing the need for cross-country pediatric patient transport and increasing the national capacity to care for children infected with high-consequence pathogens.

### **Laboratory Response Network as a Model**

In 1999, the Centers for Disease Control and Prevention (CDC), along with the Association of Public Health Laboratories (APHL) and the Federal Bureau of Investigation (FBI), founded the Laboratory Response Network (LRN).<sup>3</sup> The LRN transformed public health emergency preparedness by allowing for rapid testing of critical threat agents and efficient processes among 3 tiers of laboratories distributed across the nation: sentinel (threat identification), reference (agent confirmation), and national (agent characterization). LRN member laboratories have provided rapid response capability during a number of emergencies, including the 2001 anthrax attacks, the 2003 SARS epidemic, and the 2014–15 Ebola outbreak. During the 2012 US variant influenza A (H3N2v) virus outbreak, state reference laboratories used a diagnostic panel distributed by the LRN for rapid diagnosis.<sup>4</sup> Over 90% of those infected with H3N2v were children, and the ability of the LRN to facilitate rapid diagnosis was of direct benefit to the care of children in this public health emergency.<sup>4</sup> Overall, the establishment of the LRN increased domestic capacity for accurate testing, improved timeliness of threat identification and agent characterization, and developed a forum for continued innovation and improvement in laboratory readiness.

### **Progress During Ebola Outbreak Investigation**

The 2014–15 Ebola outbreak led to the development of a tiered approach to domestic hospital preparedness, similar in structure to the LRN.<sup>5</sup> Frontline healthcare facilities

identify potential Ebola patients, Ebola assessment hospitals care for patients during evaluation, and Ebola treatment centers provide definitive care for confirmed cases of Ebola. Having pre-identified hospitals capable of performing different functions of care for a suspected or confirmed Ebola patient is critical in effectively and efficiently providing the best patient care, while simultaneously protecting healthcare providers and ultimately the nation's health.

In a collaborative effort among children's hospitals, the CDC, and the American Academy of Pediatrics (AAP) during the 2014–2016 Ebola outbreak, children's hospitals met via teleconference approximately twice a month from December 2014 through April 2015 in a virtual forum to explore common challenges related to preparing their facility and workforce for Ebola patient care, to share innovative solutions, and to learn from case-based discussions of pediatric patients under investigation. Questions related to the management of pediatric patients under investigation provided the impetus for this forum; from July 2014 to January 2015, CDC received 89 clinical inquiries regarding pediatric patients suspected to have Ebola, 32 of whom met the case definition of a person under investigation.<sup>6</sup> The forum was established and facilitated by the CDC and the AAP, with the conversations driven by hospital administrators, pediatric clinicians, and infection control experts from across the country. Participating hospitals were located in states and territories that account for over 70% of the US population under 15 years of age (Figure 1). The jurisdictions with participating hospitals also contained the highest number of travelers returning from countries with ongoing Ebola transmission, suggesting that hospitals caring for travelers found the virtual forums relevant to their local risk assessments.<sup>7</sup> Enrollment in this forum was largely, though not exclusively, based on visits to facilities by CDC Rapid Ebola Preparedness teams—teams providing on-site assessments of hospitals with Ebola treatment centers<sup>5</sup>—and was voluntary and open to any hospital serving children. Feedback from the hospitals suggested that the calls were valuable even beyond Ebola preparedness, as the calls facilitated the sharing of best practices for infectious disease isolation and management. Preparing for Ebola has inspired some facilities to bolster these capabilities for future use in response to emerging infectious threats.<sup>8,9</sup> These calls were valuable sources of information specific to children and fostered improved readiness among pediatric hospitals.<sup>10</sup>

## Establishing a Hospital Response Network

The success of the children's hospital virtual forum underscores the need for pediatric facilities to engage in peer-to-peer discussions focused specifically on the care of children affected by emergency events. One participant whose hospital had experience ruling out Ebola in pediatric patients said: “We are learning a lot and have much to learn” (P. Stinchfield, personal communication, December 11, 2014).

The LRN and the tiered system for hospital preparedness established during the Ebola response highlight the importance of having an identified network that is specifically focused on preparedness and response to threat agents. As a result, the Department of Health and Human Services (HHS) is developing regional centers for treating special pathogens, including Ebola, to improve the nation's readiness to handle such high-consequence infectious pathogens.<sup>5,11</sup> Special pathogens could include any select agents classified by

HHS as Tier 1 under 42 CFR Part 73, and they could serve as a baseline trigger for leveraging the network's resources.<sup>12</sup> HHS is establishing a regional network to care for patients infected with special pathogens; a children's hospital response network modeled after the HHS regional network could augment our current emergency preparedness infrastructure, leveraging the children's hospitals' pediatric medical and surgical subspecialty care expertise and bringing to bear their critical care capacity to meet the unique needs of this patient population. This network could also serve as a forum for innovation and improvement in best practices of care for children.

Between the HHS regional network and CDC's strong collaborations with the AAP, there is now more than ever a forum for continued engagement and leadership among government and nongovernment partners. The National Advisory Committee on Children in Disasters has focused on pediatric healthcare preparedness in their assessments of domestic readiness and could provide invaluable input to this process.<sup>13</sup> The groundwork for this type of initiative is already in place; over 80% of the pediatric population lives within 50 miles of a hospital with a pediatric intensive care unit.<sup>14</sup> Such a network might offer a foundation for the development of expanded pediatric surge capacity, particularly for children in need of tertiary or critical care.<sup>15</sup>

The Ebola experience highlighted the need for public health linkages with private sector pediatric institutions to address emerging challenges, such as the delay of routine care for children suspected of having Ebola, healthcare worker safety, and caregiver presence at the bedside.<sup>16</sup> These challenges are not limited to 1 pathogen or 1 outbreak, as caregiver presence was identified as a unique challenge among pediatric populations during the SARS epidemic in 2003,<sup>17</sup> and preventing infection of pediatric providers was a challenge during the H1N1 influenza pandemic. A study of healthcare worker infections in 1 New York hospital during the H1N1 pandemic showed that pediatric emergency departments bore an oversized burden of infection among healthcare workers compared to almost all other departments, experiencing the highest rate of sick leave increase in a 3-month period of study between 2008 and 2009.<sup>18</sup> A network could provide enhanced standards of readiness in the hospital care sector, provide a pre-established infrastructure for prompt communications, and address these overarching issues—such as delay of routine care, worker safety, or caregiver presence—facing children's hospitals through a variety of actions (Table 1).

The structure of a children's hospital response network could follow a number of different models.

### **Option 1: Tier-Based Network**

A tier-based network is one option—one that was implemented for adult hospitals in the Ebola response. This LRN-style approach resulted in 10 children's hospitals being designated as Ebola treatment centers by their state health departments as of February 2015, with many more classified as assessment or frontline hospitals, providing a starting point for a children's hospital response network.<sup>19</sup> Hospitals would be tiered based on capacity. Lower tiers could handle triage, evaluation, and initial patient care. The Blue Ribbon Study Panel for Biodefense, a bipartisan group of former senators and senior health officials,

recommended stratifying hospitals into tiers in the near future to establish a biodefense hospital system.<sup>20</sup> The tiering decisions would be made in concert with state health departments, as they were during the Ebola outbreak.

### **Option 2: Regional Centers of Excellence**

A second option is to follow the HHS regional center model and establish regional centers of excellence for pediatric care for emerging public health threats. There are 2 children's hospitals included on the list of HHS regional centers (in GA and WA), and a children's hospital response network could serve to strengthen and amplify the pediatric healthcare system underpinning the efforts of these 2 institutions with other pediatric regional centers.

### **Option 3: Regional Communities of Practice**

A third option is for all children's hospitals to achieve and maintain a predetermined baseline level of preparedness and response capability by establishing regional communities of practice rather than a national network. These communities of practice could take place at lower levels, but children's hospitals have already made strides in establishing regional coalitions to improve surge capacity, and networking these coalitions could standardize their approaches to preparedness for high-consequence pathogens.<sup>21</sup>

## **Conclusion**

All 3 options deserve thoughtful discussion and consideration to determine the most efficient and effective model for enhancing pediatric preparedness and surge capacity among children's hospitals and the much larger healthcare system. A single model may not prove to be optimal for all communities, states, or regions; an alternative option not discussed here or a combination of options could be more desirable. Whatever the solution, the potential benefits are clear. Even the largest and most prepared facilities are not equipped to manage more than a few children sick with high-consequence pathogens. A children's hospital response network would seek to reduce the strain on hospitals that currently have the capacity to deal with these acute public health threats, reduce the burden of patient transport, provide a network of facilities able to interface with surveillance systems or asset distribution from state health departments and the Strategic National Stockpile, and ultimately provide a higher level of care for children in public health emergencies. This endeavor will encounter challenges, such as supporting facilities in resource-intensive roles, and maintaining quality of care for other patients receiving care in facilities in this network. However, the groundwork for a national network of children's hospitals was put into place during the Ebola response with the virtual forum. These gains could be translated into a sustainable solution for maintaining nimble readiness among children's hospitals.

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**Table 1**

## Potential Functions of a Children's Hospital Response Network

Potential Functions	Addressed by the Virtual Forum
• Development of consistent standards (eg, standard operating procedures)	No
• Sharing of best practices	Yes
• Policy development	No
• Emergency communications	No
• Media relations	Yes
• Isolation unit development	Yes
• Pre-positioning of scarce resources	No
• Cost-sharing across the network (eg, purchasing agreements, bulk purchasing)	No
• Interface with existing networks (eg, LRN, surveillance systems, HHS treatment centers)	No
• Regional coalition building and strengthening	Yes
• Financial planning for cost of evaluation and management of patient(s)	No
• Networking of hospital administrators, clinicians, emergency managers	Yes

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