Ensuring Preparedness during Healthcare Crises

EXECUTIVE SUMMARY

A fundamental role of government is to provide for the health and safety of its citizens. Today, the world is faced with increased challenges in controlling and mitigating the spread of epidemic diseases in an increasingly mobile society. The global health risks associated with the ongoing Ebola epidemic in West Africa is causing governments worldwide to devise strategies to identify, contain and control its spread.

Much is known about how the disease is transmitted and what measures can be taken to control further infection, including limiting contact with infected individuals, but globalization presents new challenges. The ethics of quarantine and restricted movement of non-symptomatic individuals are sometimes at odds with the reality that increased contact with the general public, and close associates, while one is symptomatic but prior to diagnosis increases the chance of widespread outbreak. Over the last six months, the virus has spread beyond its point of origin in Guinea to epidemic levels in Sierra Leone and Liberia, and in recent months has affected individuals in other African States, as well as Europe and the United States.

Although great strides have been made to quickly put into place exit screening from affected countries and, most recently, entry screening in the United States for individuals entering the country from affected areas, more can be done to tighten the gaps in terms of communication and emergency preparedness. While each screening layer improves the chances that infected individuals can be identified and isolated to avoid transmission within the general public, a thorough system of controls also must account for the possibilities that individuals may slip through the pre-entry and entry detection system either through oversight or intentional avoidance. In large measure, in the absence of observable disease manifestation, authorities must rely on travel information and self-reporting, neither of which are perfectly reliable. Additionally, alternate modes of border entry avoid the established detection system. Reporting and inter-agency, cross-jurisdictional real-time collaboration will serve to enhance situational awareness among and between agencies involved in identifying, tracking and treating infected patients, regardless of where they enter the cycle, whether at the port of entry or post-entry in the healthcare system.

We describe a secure information sharing and collaboration network that will assist and enhance efforts by the Department of Homeland Security Customs and Border Patrol, the Center for Disease Control, and local, state and federal public safety and healthcare agencies as they seek to identify potentially infected individuals, track contacts and control the spread of the virus. Regardless of changing screening practices and protocols, this HIPPA-compliant network flexes and adjusts to the addition of communication resources, technologies and sensors, allowing participants to collaborate and share information as needed for optimal situational awareness throughout response efforts.

The internet protocol (IP) based network enables the real-time sharing of voice, video and information in a secure, encrypted environment with no complex administrative or business rules engine. Collaboration sessions can be initiated by agencies on an ad hoc basis as exigencies require, and agencies can bridge existing communications and media systems as desired with other agencies, creating a seamless communications and information environment among command and control points as well as into the field. Utilizing an innovative and proven peer-based technology that does not use a central server or switch (requiring agencies trust their resources to a third party owner or administrator), each agency retains sovereign control over their own sensitive communication and media resources, sharing only when and if they deem necessary, and retracting at will. In the context of patient privacy protections, this type of system conforms to and protects confidentiality in a proactive way while enabling ease of communication across agencies.

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BACKGROUND/PROBLEM

For centuries, the world has been dealing with pandemics, the most deadly among them the 1918-1919 H1N1 influenza ("Spanish Flu") event, which killed roughly 50 million persons worldwide[1]. Up to 40% of the world's population showed symptoms of infection. Later scares came in 1957 and 1968. In each case, the social and economic impact, beyond the tragedy of loss of life, was severe. And now the world is coming to terms with Ebola, an acute, infectious, hemorrhagic virus that has killed almost 5,000 individuals worldwide, mostly in West Africa, as of the writing of this paper. The World Bank model projects a potential US $32.6 billion impact of the current Ebola pandemic should the virus spread into countries neighboring Liberia, Sierra Leone and Guinea[2].

The Ebola virus spreads from an infected patient to those who have direct contact with the patient's bodily fluids. The risk of transmission increases with the severity of the illness, which is associated with higher levels of virus production. The incubation period can be as long as 21 days from time of exposure; patients are not contagious until symptomatic. The Center for Disease Control has identified both best practices and lessons learned as they seek to provide guidance for mitigating the spread of Ebola. This paper will examine these as they pertain to, and can be solved by, communications and the emergency preparedness community.

Current Efforts

- **EXIT SCREENING:** The World Health Organization (WHO) emphasizes the importance of exit screening to reduce the exportation of Ebola from Liberia, Guinea and Sierra Leone[3]. Exit screening consists of a questionnaire and temperature screen. If temperature is elevated, an assessment for Ebola is administered.
- **ENTRY SCREENING:** As of October 13, 2014, the United States conducts entry screening at the five airports that receive over 94 percent of travelers from the Ebola-affected countries (Guinea, Liberia, Sierra Leone). Because patients may board a flight prior to showing symptoms but be symptomatic by arrival, this provides an additional gate to ensure that the disease is not imported across national borders. The Department of Homeland Security (DHS) "will exercise its authority to direct those passengers flying from Liberia, Sierra Leone and Guinea to arrive in the United States at one of the five airports with enhanced screening and resources – JFK, Newark, Dulles, Atlanta and Chicago".[4] The CDC and DHS Customs and Border Protection (CBP) participate jointly and collaboratively in these efforts. Highly coordinated communication and response between the agencies is a necessary element to successful mitigation.
- **SINGLE POINT OF CONTACT:** In the Morbidity and Mortality Weekly Report (MMWR) dated October 17, 2014, the CDC notes that a lesson learned from a daily meeting of more than 50 representatives from WHO, public health agencies and intergovernmental organizations, is the importance of a single point of contact to take responsibility for various logistical and administrative support activities.[5] Discrete accountability leads to the efficient and expeditious completion of tasks.

1 Stern, Mark Joseph, "The Worst Pandemic in History", Dec. 26, 2012, web, Slate.com, http://www.slate.com/articles/health_and_science/pandemics/2012/12/spanish_flu_mystery_why_don_t_scientists_understand_the_1918_flu_even_after.html

2 The World Bank Group, The Economic Impact of the 2014 Ebola Epidemic: Short and Medium Term Estimates for West Africa, web, https://openknowledge.worldbank.org/bitstream/handle/10986/20396/912190WP0see0a000703853l4B00PUBLIC0.pdf?sequence=1

3 World Health Organization, "Statement on the 3rd meeting of the IHR Emergency Committee regarding the 2014 Ebola outbreak in West Africa", 23 October, 2014, web, http://www.who.int/mediacentre/news/statements/2014/ebola-3rd-ihr-meeting/en/

4 Department of Homeland Security, "DHS's Coordinated Response to Ebola" web, http://www.dhs.gov/ebola-response

5 Center for Disease Control, "Developing an Incident Management System to Support Ebola Response – Liberia, July-August 2014", Morbidity and Mortality Weekly Report (MMWR), October 17, 2014, web, http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6341a4.htm?s_cid=mm6341a4_w

- **DEDICATED RESPONSE TEAM:** A dedicated CDC Response Team provides on-the-ground support to any hospital receiving a patient with a confirmed case of Ebola to ensure that all involved follow strict protocol measures to ensure the safety of all. Further support includes contact tracing, waste control and decontamination.[6] The CDC's initiative is consistent with WHO guidelines that identify a Rapid Response Team as one of ten critical components to containment of the epidemic.

- **CONTACT TRACING:** Due to the highly infectious nature of the disease to those in close contact with infected (symptomatic) individuals, WHO also includes contact tracing on their checklist as crucial to the containment of an outbreak.

- **ESTABLISHING AN EOC STRUCTURE:** The CDC established an Emergency Operations 2003, managed by the Office of Public Health Preparedness and Response to coordinate response activities and provide resources to state and local health departments in the case of an emergency. The EOC was activated in response to the world Ebola crisis in August 2014.

- **VOLUNTARY QUARANTINE:** While individual states, most notably New York and New Jersey, develop mandatory 21-day in-home quarantine policies, at the national level President Obama and the CDC cite voluntary isolation and monitoring for individuals returning from affected areas, who may have been exposed to the disease while abroad. Defense Secretary Chuck Hagel reports that, consistent with Joint Chiefs of Staff recommendations, the military will impose mandatory quarantine for troops returning from 6-month deployments to West Africa.[7]

The Ebola outbreak reminds us that we must remain vigilant about securing our borders, not just from deliberate threats, but from naturally occurring health risks such as viruses.

In recognition of the challenge of rapidly responding to the arrival on US soil of passengers who are symptomatic and require medical attention, quarantine or further action by local, state or federal agencies, as well as the healthcare sector, this paper outlines an approach to ensure expedient communications and maintained situational awareness, from the point of entry through the healthcare system and the larger community. The combination of border control, non-contact diagnosis and real-time inter-agency communication in the form of voice, video, image and data sharing at the point of entry presents the best possibility for controlling the virus on United States soil. Continual tracking of the incident and patient as they enter the healthcare system will keep all involved appraised of the progress and developing situation as it unfolds, consolidating and disseminating relevant information.

THE SOLUTION

The Ebola epidemic presents a fast-moving, constantly changing situation, with new information affecting entry screening approaches, and individual states adopting a range of protocols when dealing with possible Ebola cases. For this reason, a communication platform that is flexible and can integrate with various technologies as new approaches to screening and diagnosis are identified makes sense. The platform must be HIPPA-compliant and secure, given the highly sensitive nature of information that must be shared with a potentially large pool of incident participants, to include airport security (and other intra-airport departments) and local law enforcement, the CDC, DHS CPB and the local healthcare community.

The diagram below depicts a potential screening process, with a passenger undergoing non-contact temperature screening to determine risk of infection, concurrently with video documentation of the individual (and possibly their passport and visa). In cases where a secondary screening is warranted based on symptom assessment, the

6 Center for Disease Control, "CDC Taking Active Steps Related to Hospital Preparedness for Ebola Treatment", Press Release, October 14, 2014, http://www.cdc.gov/media/releases/2014/fs1014-ebola-investigation-fact-sheet.html

7 Military.com News, "Hagel Defends 21-Day Ebola Quarantine for Troops", web, http://www.military.com/daily-news/2014/10/31/hagel-defends-21-day-ebola-quarantines-for-troops.html

individual's image and infrared scan routes through a digital video recorder (DVR) to create a composite record, which is subsequently routed through a Video Network Interface Controller (VNIC) to be shared with the relevant outside agencies, including CBP, HHS, TSA and Airport Security, in real time. Each agency is equipped with the collaboration software to enable them to, in turn, share relevant information over the secure, HIPPA-compliant network. Individuals within each agency can share voice, video and data from their own personal devices (radios, phones, laptops, tablets, desktops) that might be important as the individual case is referred to a quarantine facility. While screening procedures may vary and evolve over time, the interoperability platform is flexible and dynamic to interface with technologies, sensors and communication devices as the need changes.

Coupling the collaboration and detection tools provides the opportunity for more rapid response, thereby containing the chance for unintentional contact of infected individuals with the uninfected workers, screeners and general population at the airport. Fortifying our health security infrastructure in this way will defend against the threat that time represents.

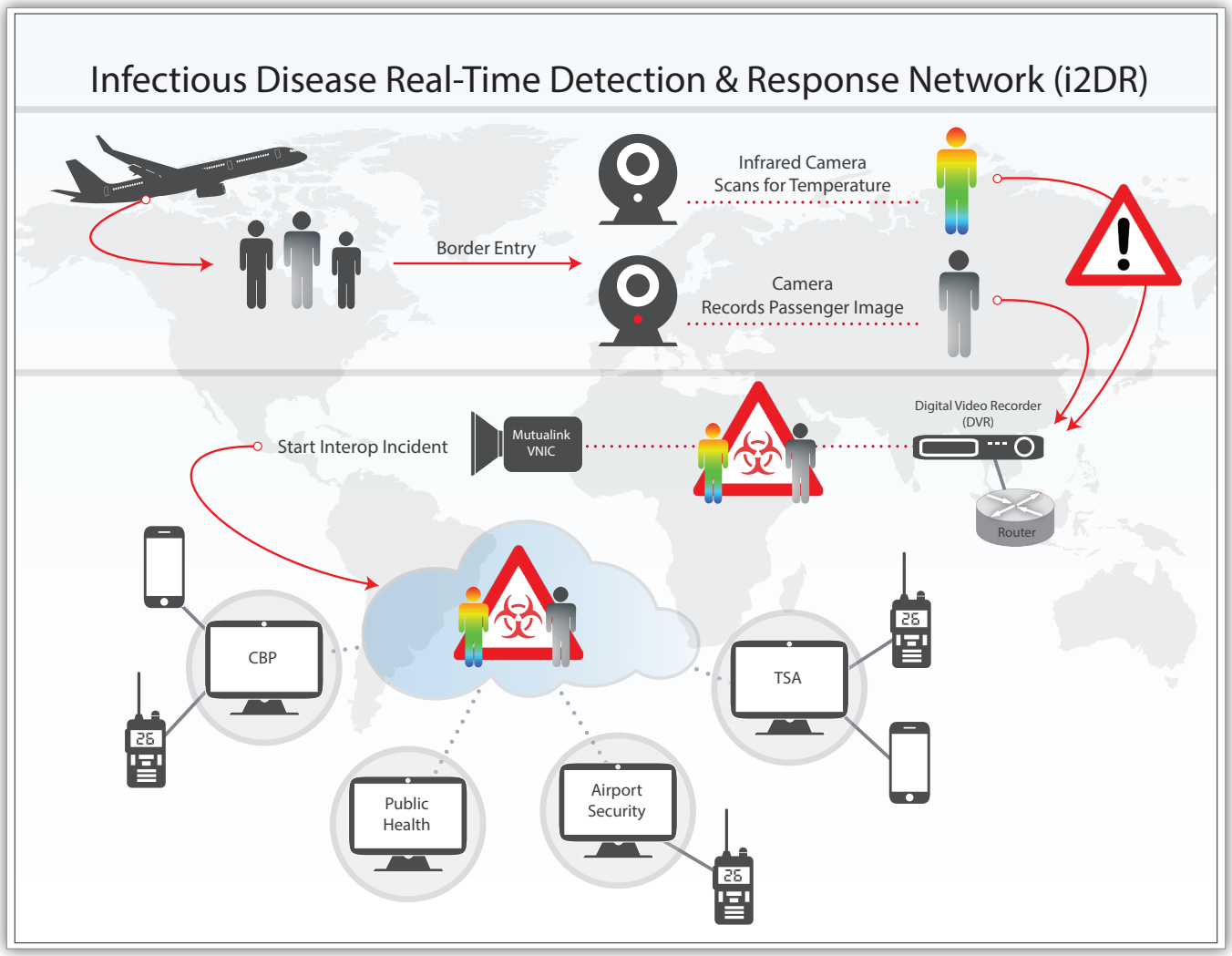

FIGURE 1: Real-Time Ebola Response and Preparedness Platform

As is well-documented, the importance of monitoring individuals who have come in close contact with infected

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persons is paramount to controlling the spread of the disease. By detecting and isolating infected individuals, the CDC will have fewer individuals to monitor, a statistic that grows in importance the more infected persons enter the country. By having protocols and technologies that allow for quick communication with gate agents, cleaning/ disinfecting crews, and handicap assistance as necessary, the situation at an airport receiving an infected individual is expediently brought under control and the infection contained. (See **FIGURE 2**) Expanded local awareness throughout the system, from ports of entry through the healthcare system, can be achieved when soft human intelligence reporting elements, to include radios (regardless of device manufacturer or band), computer systems, video surveillance and personal communication devices bridge together to disseminate critical information in real time.

Major components of this plan include:

- An IP network that enables the sharing of voice (radio and phone), imagery (still, video, thermal, etc.), data files and information in real time.
- Secure, encrypted network communications, impermeable to hackers.
- No Complex Administration and Business Rules Engine – agencies are added and are visible to others on an ad hoc basis, optimizing the network for unforeseen future partner collaboration.

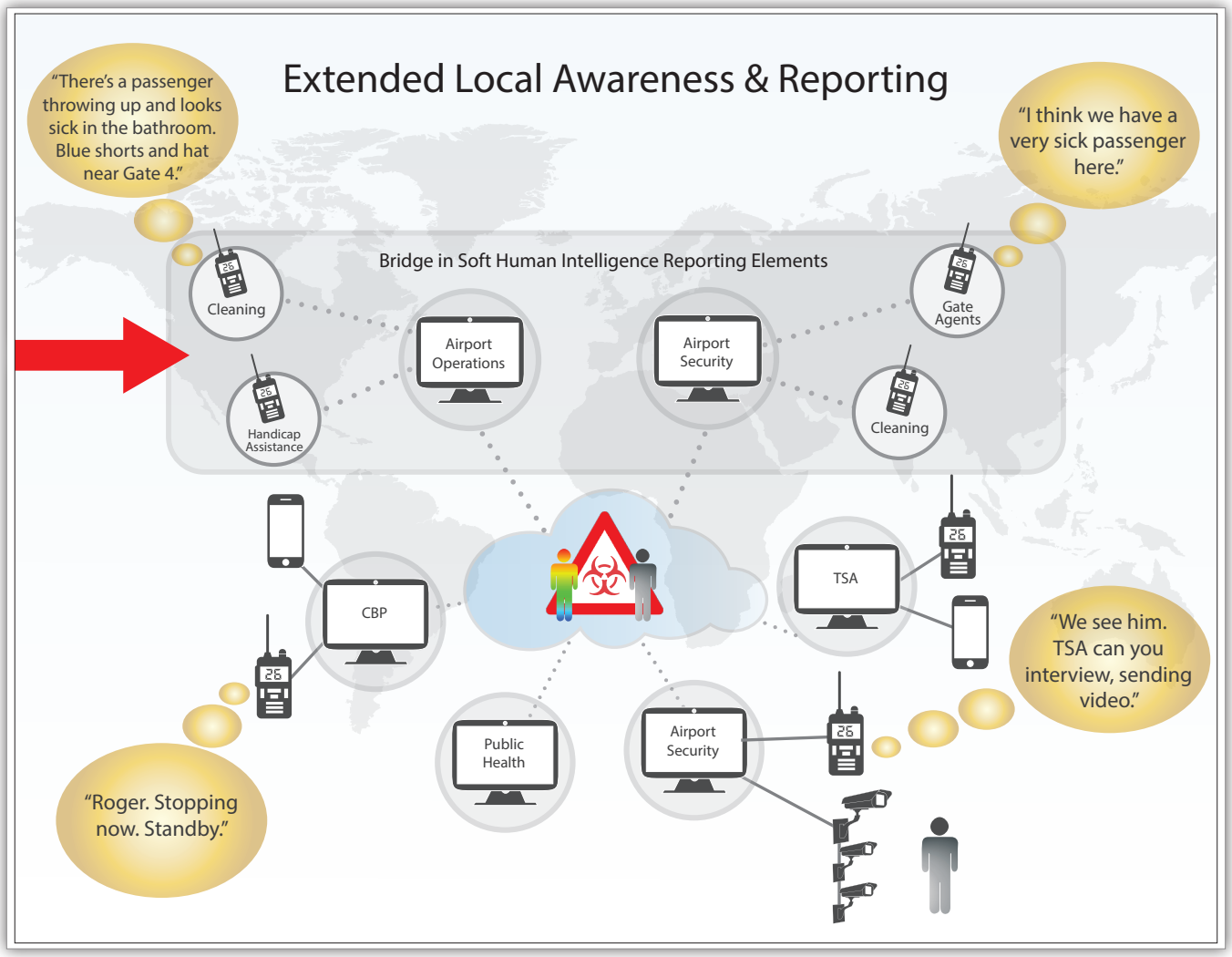

FIGURE 2: Expanded Local Awareness & Reporting

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While this approach adds significant value in the geography contiguous to the receiving airport, one can easily recognize the exponential benefit that comes with extending this collaborative real-time response network nationwide to include the other four airports accepting flights from West Africa, as well as federal agency headquarters and local response teams. By sharing information between agencies and jurisdictions on a local, regional and national basis, officials will have optimal levels of situational awareness and be better equipped to make the requisite decisions for public safety. (See **FIGURE 3**)

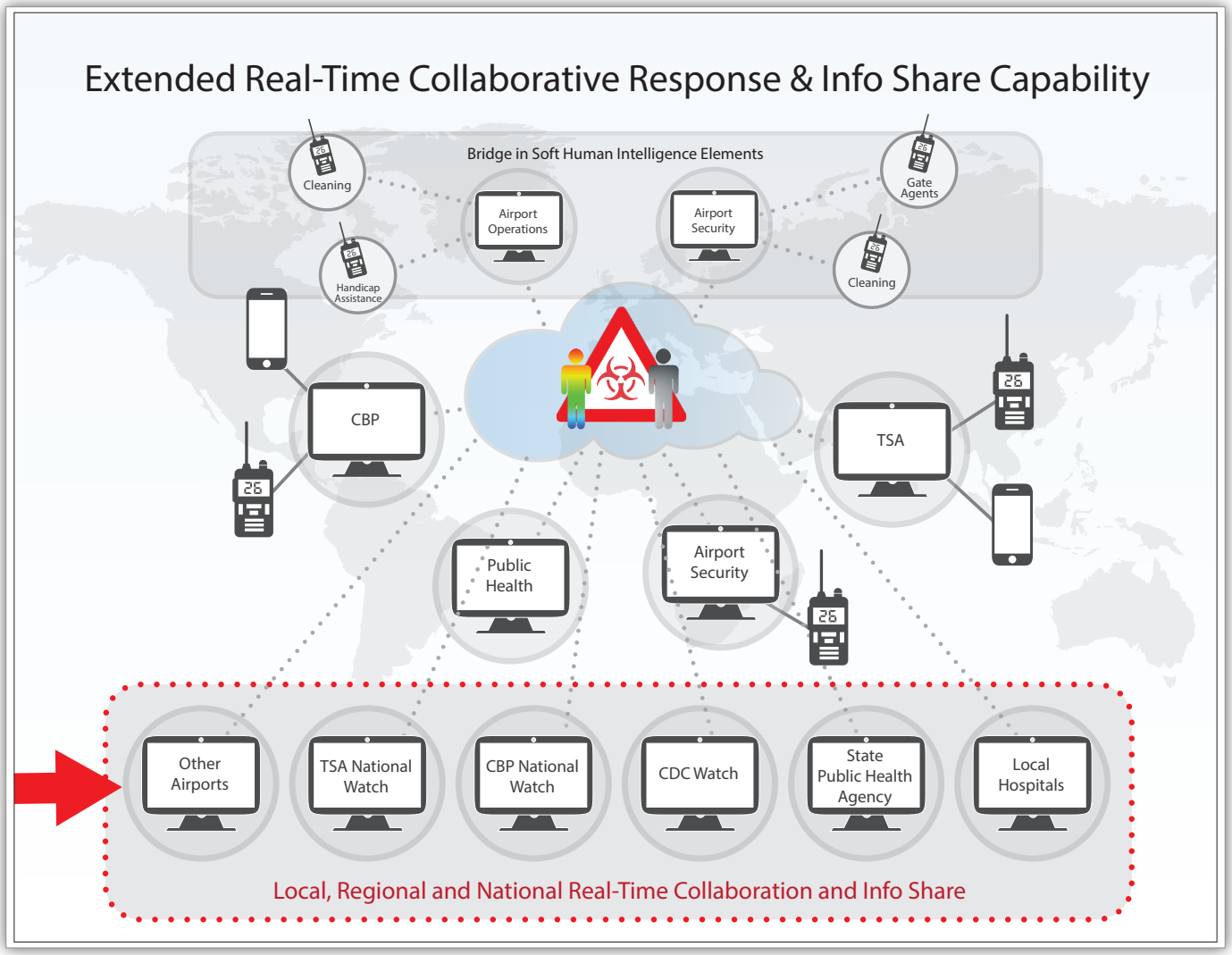

FIGURE 3: Extended Real-Time Collaborative Response & Info Share Capability

A technology called Mutualink is already connecting hundreds of hospitals, public safety agencies, emergency support and response agencies, and critical infrastructure entities throughout the nation with the capability to deliver real-time, ground-level incident management. When you deploy Mutualink not only does your agency achieve new levels of advanced communications and multimedia interoperability, you are connecting into vast, growing network of local, state and federal partners, providing new levels of interconnectivity for collaboration and coordination.

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The network leverages the eyes and ears of the airport agency and operations personnel to integrate with existing and evolving screening protocols and technologies to create cohesive and actionable control events and reporting. Whether you are using legacy assets or deploying new radio communications systems, video surveillance systems or other sensor systems, Mutualink is a key capability that enables seamless bridging and coordination within and beyond your organization. Furthermore, the collaboration session can grow and morph as the agencies and individuals required to track the patient and information (lab results, medical records, location information) change. Individuals can be invited into or exit an incident in an ad hoc way as the resource needs change.

In the case of individuals who are released but will be monitored, including contact monitoring, Mutualink incidents can remain in effect throughout the 21-day monitoring period, with activity shared and assessed throughout the three weeks. Through inclusion in the Mutualink incidents, the single point of contact can aggregate and disseminate information as necessary to promote the most positive outcome – containment of a widespread Ebola outbreak on domestic soil. The Mutualink Edge mobile application enables reporting, tracking and communicating to share information in the case of both compliant and non-compliant returnees.

CONCLUSION

A major societal, agency and policy challenge worthy of modern solutions, Ebola will certainly press us to be more imaginative and innovative in controlling the spread of the disease within United States borders.

“No matter how many of these procedures are put into place, we can’t get the risk to zero,” said Martin Cetron, director of the CDC’s Division of Global Migration and Quarantine. “This new entry-screening procedure is just one part of a multi-layered approach,” he told the JFK news conference.[8]

As the threat continues to grow, the layers must also grow, and while we might not be able to get the risk to zero, Mutualink can be part of the team that tries to see how close we can get.

8 Malo, Sebastien, Reuters. “Ebola screening starts at New York’s JFK airport”, October 11, 2014, web, http://www.reuters.com/article/2014/10/11/us-health-ebola-jfk-idUSKCN0I004U20141011