A Life-Saving Case for Applying Interoperable Data Standards to Share Hospital Availability Information in Times of an Emergency

Crisis in Haiti

The catastrophic, 7.0, Haiti earthquake took place approximately 16 miles west of Haiti's capital, Port-au-Prince on January 12, 2010. Port-au-Prince and the surrounding areas were left devastated with few homes and shelters remaining and little or no working critical infrastructure. The Haitian government reported that an estimated three million people were affected—between 217,000 and 230,000 lost their lives, more than 300,000 injured, and approximately 1,000,000 left homeless.

When the devastating earthquake first struck Haiti, President Obama directed the deployment of a full array of U.S. government agencies and assets to help meet emergency health needs in the wake of the crisis. The Department of Health and Human Services (HHS) played a leading role in this broad medical response, working in coordination with the United States Agency for International Development, the agency that led relief efforts for the U.S. Government. HHS brought critical medical assistance to the people of Haiti and the Pan American Health Organization (PAHO), which serves as the United Nations primary health organization for the Americas as well as the leading international response organization on the ground in Haiti.

In their response to the earthquake, HHS quickly established the Haitian Relief Working Group (HRWG) to assist and coordinate the United States and other international groups' recovery efforts. This group brought together Haitian and U.S. Federal agencies including the **U.S. Department of Homeland Security's (DHS) Command, Control and Interoperability (CCI) Division**, Non-governmental organizations, non-profit and faith-based organizations, vendors, and individuals to assist in immediate response and recovery efforts.

With the initial size of the HRWG exceeding 175 people, the group quickly divided into several working groups to more efficiently manage all aspects of recovery-related issues. These groups addressed the areas of management, policy, logistics, and information technology.

The widespread devastation and damage throughout Port-au-Prince and other Haitian locations severely damaged or destroyed vital infrastructure needed by emergency response groups to respond to the disaster. This included all hospitals throughout the capital; air, sea, and land transport facilities; and communication systems. The earthquake also affected many of the largest hospitals around Port-au-Prince, including the three Doctors Without Borders medical facilities. One of these facilities experienced a complete collapse.

A hospital in Pétionville—a wealthy suburb of Port-au-Prince—also collapsed, as did the St. Michel District Hospital in the southern town of Jacmel, which was the largest referral hospital in southeastern Haiti. As a response to the destroyed and damaged hospitals, numerous temporary healthcare facilities, such as clinics and mobile hospitals, were established to care for the injured.

Destruction in Haiti, post earthquake

As tons of medical and other relief supplies poured into Haiti to accommodate the thousands of wounded in need of medical attention, a logistical nightmare quickly ensued. Several obstacles prevented the successful delivery of both supplies and patients to the numerous makeshift health care facilities. Not only were most roads impassible from debris or broken roadways, but the magnitude of collapsed buildings left the wounded with no shelter and no place of disposal for deceased bodies. These situations represent only some of the challenges that prevented emergency responders, volunteers, and medical staffs from locating or finding functioning health facilities.

<div style="background:#3b5998;color:white;padding:4px">The Value of HAVE in Haiti</div>

The HRWG immediately sought to establish a way for medical personnel to identify the locations and capabilities of working medical facilities. The HRWG searched for a simple solution that would be accessible on cellular phones, personal digital assistants, and laptops via wireless networks—allowing emergency responders to identify and locate working medical facilities and critical supplies at these locations. The search for this solution presented the HRWG with two key challenges: how to collect the data from the field and how to disseminate that information to the emergency responders. To address the first issue, the HRWG issued a call to action through PAHO, requesting its staff and volunteers to send in the address or latitude and longitude of working hospitals or field units and their known operational capacity. Within days, data came in from numerous responders identifying locations throughout the impacted areas. The HRWG then faced the challenge of how to make vital medical facility information available to the emergency responders on the ground in Haiti.

The considerably damaged communications infrastructure made this challenge even more difficult. The public telephone system was

This quick, interoperable solution-driven process was a unique milestone for CCI and the Haitian Relief Working Group.

not available, and two of Haiti's largest cellular telephone providers—Digicel and Comcel Haiti—both reported that their services had been affected by the earthquake. Fiber-optic connectivity had also been disrupted.

To address these challenges, the HRWG Information Technology Working Group and various technology vendors (including EvoTec, Google, Sahana, and Shoreland) identified the Emergency Data Exchange Language (EDXL) Hospital Availability Exchange (HAVE) standard, developed by the DHS CCI Division, as being an interoperable data standard that could quickly and easily assist emergency responders in directing supplies and patients to operational health care facilities.   By combining EDXL-HAVE with Google's mapping and mobile technologies, Sahana's disaster management data collection repository, Shoreland's data set, and EvoTec's data messaging and EDXL expertise, the resultant interoperable solution allowed relief effort personnel to collect data on hospital and health facility location, operating status, medical services, and capacity. This information—that was made available by the standard's capability—was disseminated to all relief organizations via the Internet. EDXL-HAVE could easily operate within the low-bandwidth environment of the Haiti communications infrastructure. Specifically, HAVE's Extensible Mark-up Language schema allowed the operating status information of hospitals and remote locations to be accessible by multiple devices, including cellular phone, personal digital assistants, and laptops. The EDXL-HAVE standard was adapted to include only critical components that directly related to response and recovery efforts. Given its flexibility and adaptability, EDXL-HAVE was well-suited to support the lack of infrastructure in Haiti through the distribution of life-saving information.

Within five working days, a fully-operational EDXL-HAVE solution with real-time information on equipped and staffed hospitals, facilities, and available services and personnel was deployed for use by emergency responders, volunteers, and medical staff in Haiti.
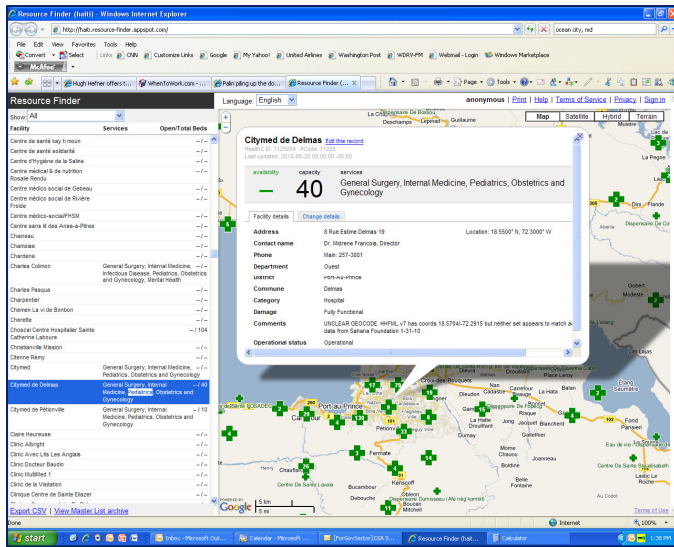
A screen shot of EDXL-HAVE as used in Haiti

As a result of deploying EDXL-HAVE to the Haitian relief effort, volunteers, hospital personnel, and other entities were able to communicate resource and hospital bed availability status with each other and other members of the emergency response community shortly after the earthquake and its aftershocks. Some of the information shared included the capacity and availability of blood and equipment; laboratory, rehabilitation, and pharmacy services; access to the facility by road; emergency room capabilities, available staff at all levels; and damage to the facility's structure and communications capabilities. Based on this invaluable insight, EDXL-HAVE became a significant factor in saving lives by assisting healthcare relief workers and officials with hospital coordination, and accurately routing patients to facilities with available resources. In one situation, the Delaware Medical Relief Team working in Haiti reported using EDXL-HAVE to initially help identify and locate medical facilities for four babies that suffered from water in the brain. The team used EDXL-HAVE to locate appropriate facilities and doctors who could perform surgery on the injured infants. This process quickly led to the evacuation and transport of the babies to a facility that could manage the delicate operation.

The EDXL-HAVE standard received approval by the Organization for the Advancement of Structured Information Standards (OASIS) on November 1, 2008, and later received acceptance as a standard by the National Incident Management System in January 2009. As a standards development organization, OASIS uses an open consortium of practitioners and technicians to develop its standards. CCI's Office for Interoperability and Compatibility continues to facilitate the development of the EDXL suite of standards in an effort to achieve technical interoperability and improve emergency data information sharing among the emergency response community.

The EDXL standards development process is based on three major principles: interoperability, multiple use, and flexibility—all of which contribute to seamless information sharing. EDXL specifications allow for ease-of-use in a wide range of applications and among different domains and multiple systems. EDXL was designed to promote a standards-based exchange of information among local, tribal, regional, state, and national systems for information-sharing purposes. During the relief efforts in Haiti, emergency responders and disaster relief workers using the EDXL-HAVE standard only had to enter data once, thus eliminating any delays in critical decision making. This streamlined process provided personnel with more time to take action based on complete and accurate information.

A special thanks to the following organizations for the success of EDXL-HAVE in Haiti:
The United Nations Pan American Health Organization, HHS Associate Secretary for Preparedness and Response, Agency for Healthcare Research and Quality, Office of Global Affairs, Office of Preparedness and Emergency Operation, Google, Evolution Technologies, the Sahana Software Foundation, and Shoreland.