

# Lessons Learned from Hurricane Sandy and Recommendations for Improved Healthcare and Public Health Response and Recovery for Future Catastrophic Events

Final Report  
December 22, 2015



## BACKGROUND

A “classic late-season...extraordinarily large hurricane,”<sup>1</sup> Sandy was the 18th named tropical cyclone of the 2012 Atlantic hurricane season. It made landfall along the mid-Atlantic coast near Atlantic City, NJ about 6:30 pm on October 29, 2012 as a Category 1 hurricane with 80-mph maximum sustained winds. But due to its extensive breadth (winds above 40 mph (tropical storm force) stretched 900 miles), Sandy’s real damage was done by a calamitous storm surge that merged with a high tide to produce a storm surge, primarily pounding the New Jersey, New York, and Connecticut coastlines (Figure 1). The United States Geological Survey measured water levels on Staten Island, New York at almost eight feet above ground level. Even after the storm moved on, it impacted inland states, including Ohio, West Virginia, and Indiana, with high winds, soaking rains, and even heavy snow in the Appalachians.<sup>2,3</sup>

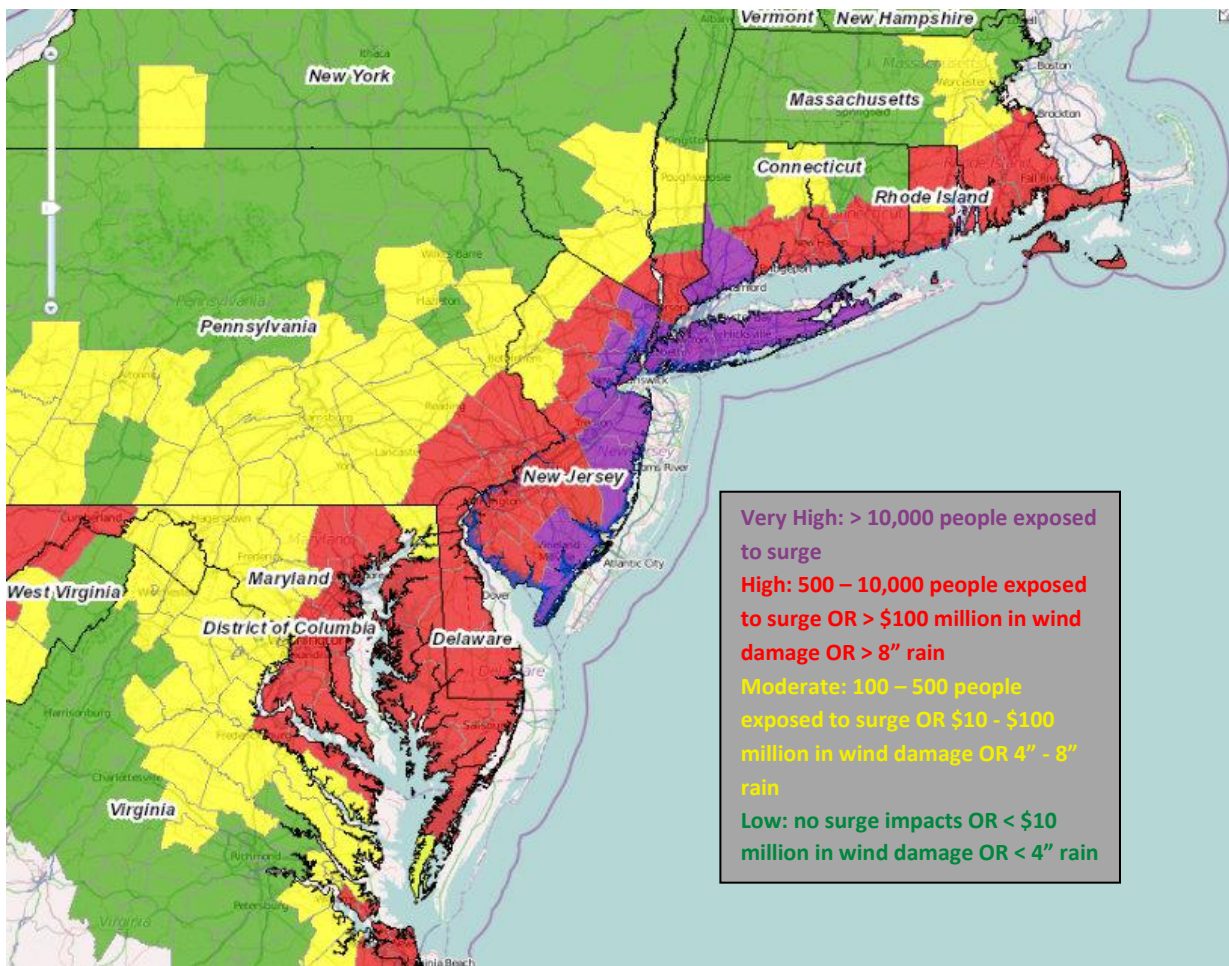


Figure 1.<sup>2</sup> FEMA Hurricane Sandy Impact Analysis

The consequences of the storm’s destructive power were significant. In the US alone, at least 72 direct deaths are attributed to the storm. Not since Hurricane Agnes in 1972 had so many

direct fatalities been attributed to a tropical cyclone. Property damage was estimated at \$50 billion, making it the second-costliest cyclone to hit the United States since 1900.<sup>2</sup> Governors of 10 states declared emergencies and requested federal aid.<sup>4</sup> If there is a silver lining, it is that the damage and the resulting impact to the healthcare system was generally limited to the New York and New Jersey areas, even though minor damage and disruptions were reported in many of the states that felt Sandy's force.

While drowning was the most common cause of death related to the storm, other health threats were causes of concern for large numbers of the population in the three most impacted states. Energy failures were one of the chief consequences of the storm, including: electrical power loss, gas shortages due to a disruption of transportation networks, and the general loss of the area's supply chains (for medical supplies, food, fuel, water, etc.)<sup>5</sup> Power loss resulted not only in inconvenience, but it compromised critical systems such as elevators, heating, and life support, most notably for those living in high-rise apartments. The elderly and those with serious medical conditions were most at risk. Short-circuited electrical systems produced fires rapidly spread by high winds. At least eight deaths (from carbon monoxide poisoning) could be attributed to the incorrect use of generators or stoves for heat.<sup>5</sup> Power loss at wastewater treatment facilities threatened to compromise the water supply, and air quality could be impacted by sediment and building debris left when the water receded, as well as by the growth of mold in inadequately renovated houses.<sup>6</sup>

The healthcare system was definitely affected by disruptions in transportation, fuel, telecommunications, and power systems. Healthcare staff had trouble getting to their work locations because transportation options were significantly reduced (limits were placed on single-occupant vehicles) and fuel restrictions were put into place. Communication between providers and patients was compromised or non-existent in many cases, and communication with city and state officials was made challenging because of telecommunication breakdowns, some of which were caused by a loss of power. Fortunately, where needed, creative solutions were devised, such as Beth Israel Medical Center staff creating an impromptu paging system by downloading an app for their smartphones when emergency generators were the only source of power remaining.<sup>7</sup>

Despite everyone's best efforts, the healthcare system was rocked by Sandy. At the time of the storm, many individuals were in the regions' hospitals; more than 6,400 patients were evacuated, and six hospitals and 26 residential care facilities in New York City alone were closed.<sup>8</sup> Estimates indicate that 75,000 people with significant health issues lived in areas inundated by the surge of water and 54,000 more in communities that suffered a total loss of power.<sup>9</sup> Those in the great New York City/New Jersey area who are dependent upon home nursing, personal care attendants, medical technologies, or even just refrigeration for maintaining critical medications were some of the hardest hit residents.

Much progress has been made in preparing the healthcare system in the US for disasters of all types. However, the Center for Biosecurity of UPMC (now the UPMC Center for Health Security) noted in 2010 that “individual hospitals, cities, states, and the country as a whole remain unprepared for a catastrophic health event...”<sup>10</sup> Even though lessons had been learned from Katrina’s 2005 assault upon New Orleans—New York hospitals had capabilities to manage evacuations—“clear and consistent criteria to guide evacuation decisions” seemed to be lacking.<sup>11</sup> Bright spots did exist, however. The National Guard was deployed in New York City to maintain order. FEMA had teams in place to coordinate federal support for the states. The Coast Guard had search and rescue teams positioned along the coast. And the Nuclear Regulatory Commission maintained oversight of the nuclear plants, three of which were shut down during the storm.

Healthcare coalitions have been touted as the foundation for disaster responsiveness for a number of years. Community-based coalitions join public health agencies, emergency medical services (EMS), private non-healthcare partners, and others in a common objective: minimize loss of life, suffering, and other serious adverse impacts on society.<sup>10</sup> Integrating systems; building redundancy into every aspect of the citywide and healthcare infrastructure (e.g., fuel pumps and electronic medical records); and practicing and training together would go a long way to accomplishing this goal.<sup>5</sup> Despite near universal agreement that such coalitions are beneficial and results of a nationwide survey revealed most hospitals identify themselves as part of a healthcare coalition,<sup>10</sup> Sandy revealed that solid emergency preparedness is far from a reality.

## Goal of the Investigation

In light of outcomes from Sandy’s unwelcome incursion into a densely populated region of the Atlantic seaboard, a research project was developed to evaluate how the healthcare system was negatively affected in preparation for, during, and after Hurricane Sandy. This information will be used to develop action steps to better prepare healthcare professionals, medical facilities, and public health for future mass casualty events.

## METHODS

### Study Design

This study was designed to use qualitative methodologies, specifically surveys and interviews.

From June 2014 to August 2015, the American College of Emergency Physicians distributed and collected surveys, performed phone interviews, conducted on-site visits with hospital and EMS personnel, and compiled and analyzed data.

The Hurricane Sandy project began with a day-and-a-half stakeholders' meeting in Dallas of invited participants representing three major groups:

- Twelve states the Federal Emergency Management Agency (FEMA) declared affected by Hurricane Sandy: Connecticut, Delaware, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Virginia, West Virginia, plus the District of Columbia
- Twelve national and local organizations, such as American Academy of Pediatrics (AAP), American Hospital Association (AHA), Monmouth-Ocean Hospital Service Corporation (MONOC) and New York City Department of Health and Mental Hygiene (NYC DOHMH)
- Subject matter experts (SMEs) with first-hand knowledge of the issues encountered during the response and recovery to Hurricane Sandy who represent disciplines critical to health care disaster planning, specifically: Emergency Nurse's Association (ENA), International Association of Hospital Security and Safety (IAHSS), and International Association of Emergency Managers (IAEM)

During the stakeholders' meeting (See Appendix A for list of participants and their affiliations), participants reviewed and discussed published reports, articles, and other data related to the thirteen areas affected by Hurricane Sandy. Issues encountered in each geographic area were identified, with particular attention paid to issues unique to specific areas. Using the list of identified issues—and incorporating the specialized knowledge and expertise of the SMEs—a self-assessment survey tool was created. The intent of the survey instrument was to establish baseline data relating to the disaster plans that were in place prior to Hurricane Sandy. Topics addressed by the survey questions included:

- Preparedness
- Operations
- Communications
- Leadership and organization
- Staffing and resources
- Recovery and further planning

Survey questions were tailored for each target group: hospitals and EMS. The survey tool for hospitals contained 129 questions; the EMS survey contained 69 questions. (See Appendix B for copies of the hospital and EMS self-assessment surveys.)

### Self-assessment Survey and Participants

A list of hospital and EMS groups in the 13 areas identified by FEMA as affected by Hurricane Sandy was created through ACEP and ASPR resources. A primary contact at each facility then was identified and asked to be responsible for completing the survey through an e-mail invitation. Surveys were distributed electronically using the Survey Monkey tool to hospitals and EMS groups through appropriate state organizations and two hundred members of the ACEP Disaster Section within the thirteen affected areas. Follow-up reminders were distributed



to increase completion of the assessments. Fifty-three hospitals and 17 EMS groups responded to the self-assessment survey.

In the process of creating the list of survey participants, a number of healthcare organizations in several states responded they had either minimal or no healthcare system impact related to Hurricane Sandy. These states were polled through questionnaires sent to state EMS Offices, Emergency Management Offices, and State Hospital associates. These states were: Ohio, New Hampshire, Vermont, West Virginia, and North Carolina.

### On-site Visits

On-site visits were scheduled and conducted at facilities selected for their central location within the group of affected areas. The purpose of the on-site visits was to review and clarify information provided on the self-assessment survey and to identify gaps (e.g., absence of disaster plans for how to respond to a certain situation) and/or plan failures (e.g., plans in place that did not work correctly). Two teams of SMEs conducted the site visits. (See Appendix C for the names of team members.) Interviewees were volunteers selected based on their roles in disaster preparedness or disaster management within the participating hospitals and EMS groups. Twenty-four hospitals and seven EMS groups participated in the on-site visits, which took place in New York City; northern and coastal New Jersey; Boston, MA; Baltimore, MD; and Washington, DC. (See Appendix D for list of hospital and EMS participant locations.)

### Phone Interviews

Structured interviews were conducted by telephone to determine the effect of Hurricane Sandy on ancillary services. For the purposes of this study, ancillary services entities fall into four basic categories: pharmacies, methadone clinics, dialysis/kidney centers, and medical supply companies. Businesses surveyed were located in New York, New Jersey, and Connecticut. A total of 52 entities participated in the interviews.

Questions focused on the impact of the storm on business, existence of disaster plans and formal transfer agreements, and actions taken during and after the storm. (See Appendix E for the ancillary services interview questions.)

### Data Collection and Analysis

The data collected from the self-assessment surveys and the site visits were collated and analyzed to identify major issues and lessons learned during Hurricane Sandy. From the data analysis, a set of recommendations was developed for improvements to disaster plans in place prior to Hurricane Sandy. Improvement priorities for existing disaster plans also were created.

Initial review of responses to the online surveys revealed that most hospitals in the broad geographic area identified by FEMA as affected by Hurricane Sandy (twelve states and the

District of Columbia) experienced minimal or no impact on healthcare from the storm. Hospitals throughout this geographic area experienced heavy rain, minimal flooding, power outages or other weather-related issues; some activated their Incident Command Center, but patient care was not negatively affected. Based on the initial survey findings, on-site visits were concentrated on directly affected areas and not within all 13 FEMA-listed areas.

## RESULTS

The results of the study are based on responses from online self-assessment surveys, on-site interviews, and structured phone interviews. Responses were compiled and analyzed to identify impact issues faced during Hurricane Sandy by each of the participant groups: hospitals, EMS, and ancillary services.

Online self-assessment survey and site visit responses indicated that most of the facilities within the 12 state regions plus the District of Columbia declared by FEMA as impacted by Hurricane Sandy escaped serious impacts to patient care. The high-impact areas were located within New York, New Jersey, and—to a lesser extent—Connecticut. A range of effects from the storm was noted, even within the high-impact areas. Some facilities underwent full evacuation, while others experienced short-term power outages and the inability of employees to get to work.

Hospitals in the Baltimore /Washington, DC and Boston metro areas sustained minor impact. Hospital Emergency Operations Centers (EOCs) were activated in both metro areas. The hospitals sheltered in place and suffered minimal effects from short-term power loss. Hospitals were not closed and, in fact, in the Baltimore /Washington, DC area, at least one hospital provided additional dialysis services to the community because some private centers were closed.

### Shared Issues

Three issues were shared by all three groups of respondents: power loss, flooding, and staffing. Another issue shared by hospital and EMS respondents was communication. Effects of these four impact issues on the respective participant groups are grouped to show similarities and differences.

#### Power Loss

Loss of power affected 18% (14) of the hospital participants, 21% (5) of the interviewed EMS organizations, and 56% (29) of the ancillary healthcare organizations.

In numerous areas, the power grid shut down leaving facilities and even the EOC without power; in other areas, power lines were downed by flooding and high winds causing loss of power. Power outages meant that large geographic areas were blacked out for a time, and

many were without power after the storm. While hospitals and nursing homes are required to have backup power sources, adult care facilities are not. Loss of power forced hospital facilities to rely on generators, which also failed at some facilities.

Widespread loss of power coupled with flooding compromised the ability of some hospitals, nursing homes, and residential facilities to shelter in place, resulting in evacuations which stressed patient transportation options. Unless backup power was available (and not all facilities had such access) a power outage affected everything within a facility from communication and patient records to patient care.

For ancillary services, such as pharmacies and kidney/dialysis centers, power outages lasted an average of 2.5 days, with the range being approximately one day to about 5 days. In some cases, the facilities were open with reduced power or reduced functionality, in order to continue serving their clientele.

### Flooding

Flooding from Hurricane Sandy's storm surge damaged multiple facilities, led to full or partial evacuation of several hospitals, and caused temporary closure of multiple hospitals around the greater New York City/New Jersey area. Millions of gallons of water inundated basements and first floors of facilities located in the storm's path. In addition, flooding caused patient areas to be shuffled and destroyed food stores as well as critical systems and equipment, such as generators. A hospital's location—both its elevation (height above sea level) and proximity to the coast—often determined whether or not a facility flooded.

Of the hospital facilities included in this research, approximately 8% (6) reported they experienced flooding. Flooding reportedly was minimal for facilities located outside of the New York, New Jersey, and Connecticut area. At least five FDNY stations were flooded. Other EMS organizations suffered non-specific damage from the floodwaters. In all, 33% (8) EMS organizations interviewed recognized flooded stations as an issue. One EMS organization had its bay doors destroyed by water pressure during flooding and lost three vehicles. In addition, flooding and structural damage was indicated as the primary cause (or jointly with power loss) of business impact by 10% (5) of the ancillary services entities surveyed.

### Staffing

In general, weather reports about Hurricane Sandy allowed staff time to prepare for the storm and report to work. However, due to flooding, staff in numerous hospitals were unexpectedly required to shelter in place. In these circumstances, staff were unable to take care of family needs, especially staff who were already on duty before the storm.

In some areas, professional and support staff had trouble getting through security checkpoints and access points. Another concern related to the sudden shutdown of mass transit within the



New York City, which created a need for additional coordination between hospital administration and staff. When facilities decided to seek additional out-of-state staff, an issue arose related to the credentialing of personnel across state lines; one facility experienced a shortage of physicians.

Staffing issues were identified by 6% (5) of the hospital respondents. Staffing/personnel issues affected 13% (3) of the interviewed EMS organizations. The event taxed the EMS teams, since they had to staff shelters and road closures in addition to maintaining their emergency and non-emergency transport responsibilities. After the event, it was determined that few or no plans had been made to address the mental health factors of healthcare workers, including EMS staff. This should have been an important consideration, since some staff suffered the loss of their own homes and had to shelter at hospitals or stations. Another example of how taxed the teams were is that at least one interviewed organization initiated the use of students to assist. Adding to the stress of health care workers was the concern for safety of their family members while the staff had to remain at their hospital, emergency response agency or other facility.

Ancillary services discussed staffing as the second most important factor impacting their operations. Approximately 35% (18 facilities) indicated that employees could not get to work, which hampered their operation. Given the flooded, blocked, and/or damaged streets, in addition to public transportation closures, this was a common problem across the region. Access to fuel was a problem that probably contributed to employees not being able to get to work. Flooding or structural damage to their own homes was another contributing factor. Since the ancillary services businesses typically have a small work force, even missing a few employees could significantly impact their operation.

### Communications

Both hospitals and EMS participants reported communication issues. Most significant were problems related to a lack of redundancy in communication systems and the communication complications caused by loss of power. Other issues included lack of direct communication between hospitals and EMS, lack of dashboards and status updates, incompatible frequency issues between EMS and hospitals, and the need for improvement in communication both with public health and between state and Office of Emergency Management (OEM).

Communication issues were reported by 9% (7) of the hospital participants and by 63% (15) of the EMS organizations.

Towers and transmitters were disabled and people working in Emergency Operations Centers could not communicate (radio or Internet). Lack of power also meant no e-mail for many state, county, and local government locations for several days. Mobile devices largely withstood the outages, and they provided alternate e-mail, text, and Internet service.

Although a number of technical issues were reported, broader communication issues included:

- Lack of integrated communication among all agencies involved in the response
- Lack of timely information related to assignments
- Lack of representation at State level of the Office of Emergency Management
- Significant increase in 911 calls (in NYC: from 3200 to 8000 per day)
- Multiple layers of bureaucracy became unwieldy
- After the event, some patients had already been evacuated when EMS arrived and some addresses weren't "real"

### Additional Hospital Impact Issues

Based on assessment of the data gathered from hospital facilities, twelve issues were identified as impacting healthcare during Hurricane Sandy (Figure 2). The issues of power loss and communications (both discussed above) concerned the most hospital respondents.

#### Evacuation

Of the hospital participants, 14% (11) reported they evacuated some or all of their patients. Evacuation was triggered by factors such as flooding, loss of power, or failure of mechanical and electrical systems. The issues identified by facilities that evacuated included:

- Lack of pre-planning, including insufficient equipment and undefined procedures
- Lack of frequent staff training on how to use evacuation equipment
- Delaying notification of EMS
- Waiting too long to evacuate
- Staging ambulances too early
- Inappropriate storage locations for equipment

One facility's evacuation sleds and chairs were stored in the basement and had to be carted to an upper floor which, after power was lost, meant transporting them up many flights of stairs.

Reportedly patients were at times evacuated to network facilities based on the receiving hospital having comparable resources to provide patients their current level of care. This resulted in patients being evacuated to facilities within the same or nearby flood/surge zones.

Where facilities faced evacuation problems, there seemed to have been poorly defined or no procedures at all, as well as unidentified triggers or criteria for deciding whether or not to evacuate patients.

#### Generators

Widespread power outages forced hospitals, especially in New York and New Jersey, to rely on backup generators. However, frequent problems occurred, including generators that failed due to overuse or that were insufficient for the amount of electricity needed by HVAC and other

essential operations. Lack of fuel for generators presented another concern for some facilities. Six facilities (8%) reported generator issues.

### Supplies

Supply issues were identified by 3% (2) of the participants. Flooding and loss of power significantly affected the supply chain for hospitals. One respondent reported the facility ran out of supplies; another reported all food stores were destroyed by basement flooding.

### Transport Assets

In response to increased medical transportation needs, mutual aid and other plans resulted in deployment of EMS resources from outside the impacted area. These plans were reasonably effective in providing additional assets. A serious issue related to transport units concerned out-of-area EMS resources getting lost or the lack of pre-planning with EMS on how to effectively utilize these additional resources. One respondent reported that the hospital was able to get a number of ambulances, but they would follow each other instead of going where they were assigned to go, which resulted in patient tracking issues as patients were transported to a different facility from where they had been assigned.. Another issue related to out-of-state ambulances not being allowed to operate within a specific city without having city or state inspections. It was reported that some deployed units did not meet the capabilities set forth in the mutual aid agreements/contracts. Transport assets was an issue for 5% (4) of respondents.

### Patient Tracking and Patient Records

Tracking patients is a challenge during an event like Hurricane Sandy when hospitals were forced to evacuate patients, often without power or access to computers. As patients are evacuated, information such as identification, receiving and sending locations, as well as medical records should be moved with each patient, but due to loss of power or computer capabilities, tracking and record keeping must be accomplished by alternative techniques including changing to paper. In some instances during Hurricane Sandy, patient tracking was compromised by ambulances delivering patients to the wrong facilities and by misunderstood bed definitions. One facility reported transferring patients without records. Patient tracking was an issue for 4% (3) facilities and 3% (2) identified patient records as an issue.

### Fuel Shortage

Closely related to supply issues was the shortage of fuel, noted by 3% (2). Fuel supply affected not only hospital generators, but also availability of staff, delivery of supplies, and operating ambulances.

### Crisis Standards of Care

Only 1% (1) of hospital respondents mentioned using crisis standards of care. This altered or change in expectation of care was based a medication shortage causing delays in dosage for some patients.

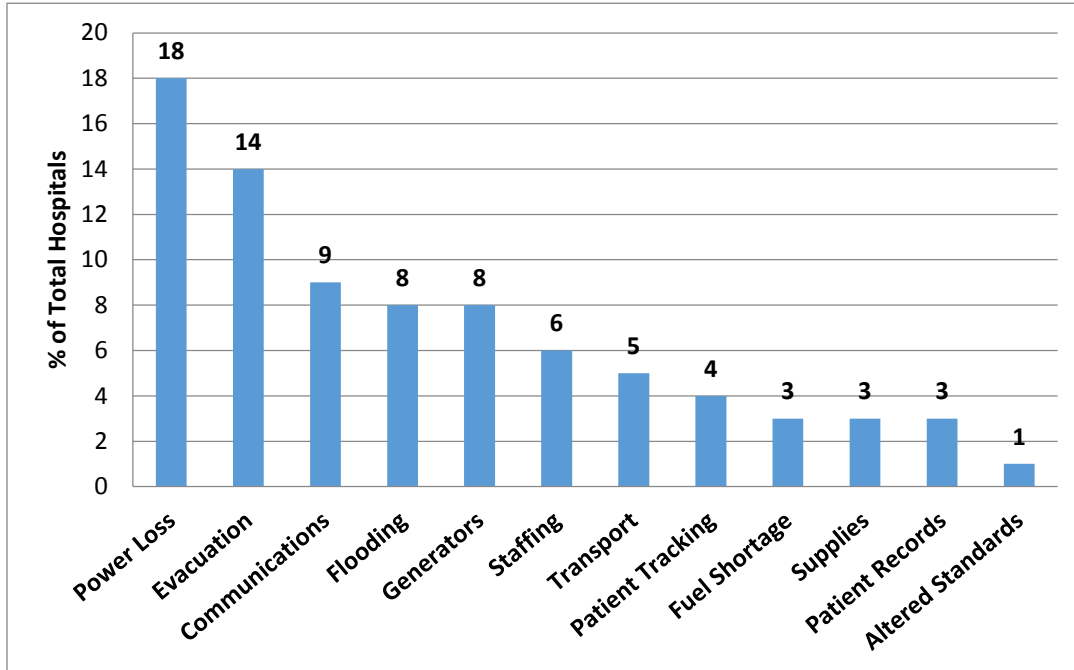


Figure 2. Hospital Impact Issues

### Additional Emergency Medical Services (EMS) Impact Issues

Based on data reported by EMS organizations, fourteen issues were identified as issues during Hurricane Sandy (Figure 3). The issues of communications (discussed above) and transport concerned the most EMS respondents.

#### Transport

Because Hurricane Sandy was anticipated to be a large event, a number of states provided supplemental ambulances. These units assisted with facility evacuation, shelter support, and, after the storm, search and rescue, as well as continuity of operations for hard-hit locations. While this effort was embraced, it did surface some issues because some standards and practices differ across state boundaries, experienced by 54% (13) of the EMS organizations interviewed. For example:

- Cross-state credentialing was suspended in New Jersey, but outside providers often got lost, which meant that some EMS organizations had to send volunteers to guide ambulances
- Out-of-state ambulances cannot operate in NYC without being inspected

Another issue in this category experienced by EMS organizations was the delay created when patients were transferred to another “in-network” facility, due to the additional distances involved in the transport.

### Representation

Of the EMS organizations interviewed, 54% (13) experienced issues related to representation with Emergency Management. Issues cited include:

- Lack of representation at state Emergency Management meetings
- Volunteer organizations having no seat in city planning and are not involved in drill planning
- None of the affected services represented by the EMS organization has direct representation
- Not under ESF-8 operation, so they worked under Healthcare Facility Evacuation Centers (HEC's)
- No situation reports were received from the New York City Office of Emergency Management (OEM) on conditions
- FEMA didn't request assistance from a local EMS provider that had 30 ambulances staffed but were not used

### Patient Access

Primary evacuation routes were flooded, blocked, or damaged. A fairly large number of the interviewed EMS organizations (50% or 12) reported that flooded streets prohibited responses. In addition, since certain areas were inaccessible, shelter-in-place orders had to be given in place of evacuation orders, eliminating access to those patients.

### Fuel Shortage

This issue impacted 33% (8) of the EMS organizations that provided data. In most cases, all primary response units and backup vehicles were fueled in advance of the storm, but private citizens were also trying to be prepared, and they were filling their vehicles too, and this produced shortages and long lines at stations. Some EMS organizations had a difficult time getting gas at predesignated stations. Diesel was less difficult to obtain for some EMS organizations, but long lines made access a challenge. Gas stations that had power saw lines that were, in some cases, miles long. Waterborne shipments of gas were shut down or limited, and flooding or power loss resulted in terminal shutdowns. There was no system in place to

prioritize which areas received fuel. In some cases, ambulances had to jump lines of civilians. Also, in some cases, police agencies limited ambulances at the pump.

## Evacuation

### Evacuated Hospitals and Nursing Homes

Several difficulties related to evacuations were reported by 29% (7) of the EMS organizations. These included:

- Timing issues with hospitals
  - Delay occurred at some evacuation sites while decisions were made about transport
  - Delay occurred with coordination between facilities, and the ambulance waited as the receiving facilities prepared to receive patients, delaying return to service for the EMS unit
  - In some cases, the hospitals called too early for ambulances, and they sat idle while patients were being prepared, effectively removing the unit from availability
- Planning, leadership, and training issues
  - In some jurisdictions, EMS was not at the table when disaster plans were created, especially if the EMS was a private provider.
  - EMS called to evacuate by the county rather than hospitals, which they weren't expecting
  - No clear chain of command was in place between EMS and hospitals related to evacuations
  - Lack of a contract with an EMS organization caused delays in evacuations
  - Some nursing homes were not trained for evacuation
  - Some EMS organizations did not have water rescue training or equipment
- Transport and receiving issues
  - Difficulty in hospitals receiving patients from nursing homes
  - Having to send patients to a "system facility"
  - Some shelters attempted to turn away the evacuated nursing home patients
  - Some nursing homes refused to evacuate at first

## Supplies

Shortage of portable oxygen during the storm was the most frequently mentioned supply issue, and it continued for days after the storm was over. Creativity was employed regularly; for example, one EMS unit got oxygen from a scuba diver. Shortage of linens and basic supplies at shelters was also reported. Of the EMS organizations interviewed, 29% (7) indicated some type of supply issue during or immediately after the hurricane.



## Patient Surge

While several facilities indicated they experienced a patient surge after the hurricane, none indicated they had any issues in dealing with or handling the patient load. This was attributed to the fact that they had planned and drilled for patient surge events and had previously discharged significant numbers of patients prior to the hurricane.

## Patient Records

When patients are transferred from facility to facility, access to their online records (or a paper copy of the record) should move with them. However, sometimes patient records were not sent. This was mostly a nursing home issue, but it was true for some hospitals. Patient classification was an issue in some cases, as patient categories sometimes differed across jurisdictions or between facility types. In order to facilitate the transfer, some patient records were altered to a one-page paper report. 29% (3) of the interviewed EMS organizations experienced some type of problem with patient records.

## Patient Tracking

During Sandy, no statewide or region-wide system was in place to track vulnerable patients and residents, who had to be transferred to alternate locations due to flooding, power outages, or damage to facilities. Some individual hospital patient tracking systems—Electronic Health Records, bar-coded wristbands, or other devices—weren't working, as reported by several EMS organizations (17%, or 4 of the interviewed organizations).

## Healthcare Coalitions

Coalitions, being geographically based often were unable to meet the demand when the event impacted many of the coalition member agencies and hospitals, such as happened in lower Manhattan. While efforts to keep patients within a "network" often resulted in longer transfers, use of similar EHR, similar procedures and established communication channels within the hospital system or network may have simplified some of the process. The concept of allowing a health care system to function as a "health care coalition" is worthy of further review.

## Generators

Once the main power source is lost, backup generators are supposed to provide required power to maintain operations. In several cases (16% or 4 interviewed EMS organizations), generators did not perform as expected. For example, one EMS organization reported that the backup generator provided insufficient output for full operational needs, which resulted in a loss of HVAC.

### Crisis Standards of care

In mass casualty and/or disaster situations, such as Hurricane Sandy, it is sometimes necessary to use crisis standards of care protocols to maximize the number of lives saved. EMS teams faced a few situations in which this was required. For example, due to pharmacy supply, pediatric doses were hand-calculated. Also, some EMS organizations (2, or 8%) were forced to perform public health functions at unregulated shelters. Some of these public health functions are not part of normal EMS training or operations.

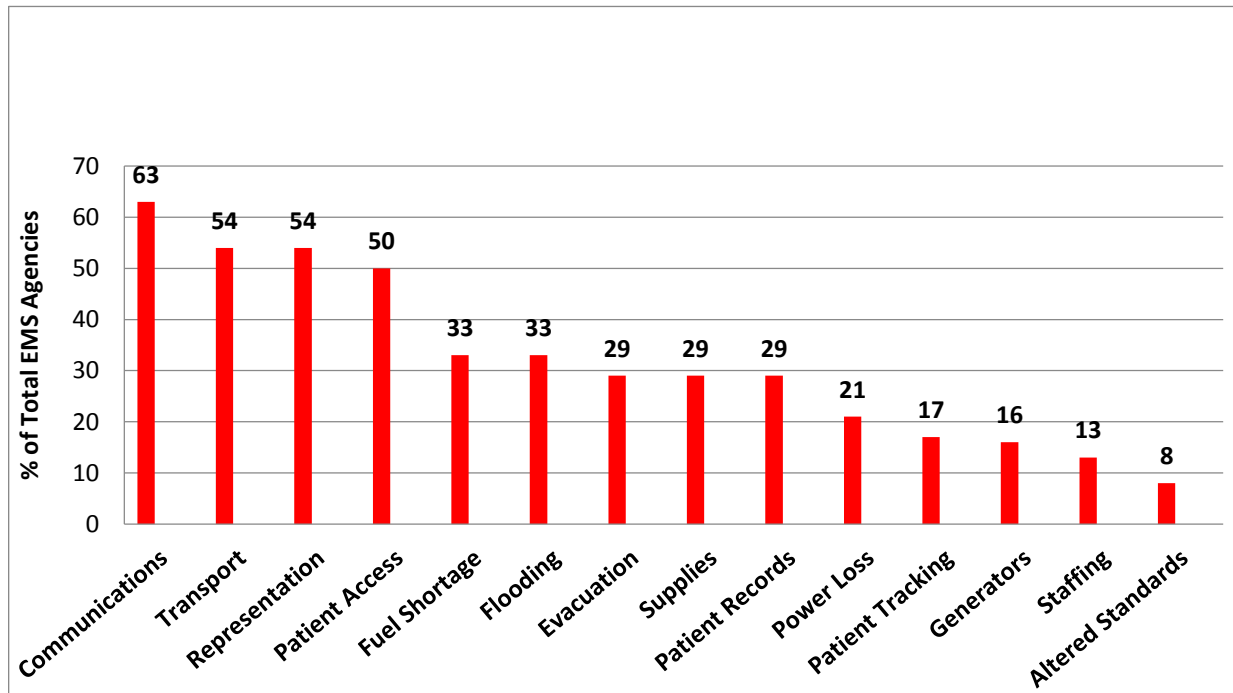


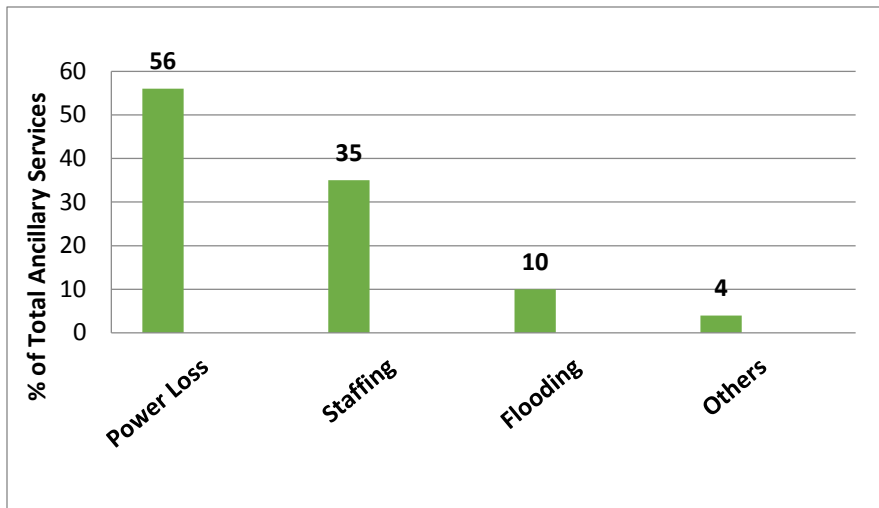
Figure 3. EMS Impact Issues

### Additional Ancillary Services Impact Issues

Three major issues were identified by ancillary service interviewees (Figure 3). All of the issues identified by this group were shared by hospital facilities and EMS organizations and were discussed above. These ancillary services are often an important part of health care delivery but their sustainment is not prioritized in some disaster plans. 152.11.111.38

### Other Impacts

Two ancillary services entities (4%) mentioned other, minor causes for business disruption than the causes above. They were: running out of supplies and overflow from other clinics. Of those businesses surveyed, 21% (11) reported negligible or no impact from the storm that kept them from operating.



**Figure 3.** Ancillary Services Impact Issues

### Discussion of Results

Hurricane Irene (landfalls in New York and New Jersey in August 2011) may have provided a false sense of security with respect to advance preparations for Hurricane Sandy. Irene was projected to be a major storm, and actions taken then were not implemented for Sandy’s arrival because Irene ultimately had a greatly reduced impact than was expected. Interventions initiated in anticipation of Irene but not required were felt to have been “unnecessary”. A survey question in this study about prior experience with disasters and the related response to Hurricane Sandy indicated that many felt they were prepared because prior preparations had served them well in their facilities.

For the hardest hit areas of New York, New Jersey, and Connecticut, prior planning and preparation seemed to be insufficient to withstand Sandy’s force. Most hospital facilities in the New York City and nearby New Jersey areas sheltered in place; however, 12 hospitals had to evacuate, although three of the 12 were only partial evacuations. Action to harden facilities (such as protecting generators, fuel pumps, and fuel supplies) that had been recommended after Irene were not widely implemented. Hospital evacuation plans had not been operationally drilled or practiced, and EMS organizations—in general—felt like they had not been included in planning for a disaster scenario.

As noted above, all three study participant groups (hospitals, EMS organizations, and ancillary services) were impacted by power loss, flooding, and staffing issues. Communications issues plagued both hospitals and EMS organizations, but they were not as large a concern to ancillary services entities, most likely because they operated more as standalone units.

It is easy to see that, taken together, these four issues (power loss, flooding, staffing, and communications) form the foundation of the jolt sustained by these hard-hit areas. In fact, it could be argued that these issues, taken as a whole, produced the domino effect of other, more moderate impacts to the region. For example, flooding affected fuel deliveries, shut down subway service, and cut off individuals (or whole communities). That directly affected healthcare employees trying to get to work as well as EMS access to patients who needed to be evacuated but were rendered inaccessible by flooded or blocked roads.

### STUDY LIMITATIONS

Since the qualitative methodology of self-assessment surveys and interviews was used, this study is limited by possible self-report, recall, and experience biases. The period of time, three years, since the occurrence of the Hurricane Sandy event may have compounded these biases. The selection method for survey subjects and site visit locations was not based on a random sample approach, thus key respondents may have been omitted. Furthermore, as organizations self-reported, there is the possibility that organizations that had more extensive problems or performed better might have chosen not to participate.

Our survey and site-visit questions were not piloted before distribution and use. They, therefore, may have contained questions that were not sufficiently vetted for the target audience or the study goals.

### BEST PRACTICES

Best practices identify a process, technique, or system that performs well in a specific situation, in this case, Hurricane Sandy. Best practices can help organizations improve their preparedness, efficiency or effectiveness. Identifying and applying best practices can improve response and recovery during a situation similar to this event. Typically, best practices are positive activities that can be considered for adoption to produce successful outcomes.

Based on interviews, survey responses, and site visits, the following best practices were revealed.

- Hospital staff and volunteers cross-trained in multiple tasks areas
- Stocking of extra supplies in advance of storm
- Maintaining staff on payroll, so they are available as facilities reopen
- Providing housing and other support for employees whose homes were damaged or destroyed
- Monitoring school closures for their impact on staffing levels

- GIS mapping of staff home addresses to identify possible issues with staff being able to report to work
- Staff from closed offices or facilities reassigned to assist other functions in those facilities that remain operational
- Backup e-mail with Yahoo or Gmail, because if one of their servers goes down, they are located in multiple, redundant locations so e-mail can continue without interruption
- Focus on coordination between the receiving hospitals as well as the transferring hospitals (and move staff, medications, and resources along with the patients)

## LESSONS LEARNED / RECOMMENDATIONS

Many valuable lessons have been implemented from experiences in previous hurricanes such as Irene and Katrina, however, events during Hurricane Sandy reveal that further action is needed to alleviate issues identified in this study. Even though they are not new, challenges remain in the journey to respond effectively and efficiently to disasters such as Hurricane Sandy.

Lessons learned are based on the true-life experience of a particular situation or event and often come from working with and solving real world problems. In addition to the identified problems, lessons learned include solutions for how to solve the problems. Reporting lessons learned helps begin the process of eliminating the problems when they occur in the future.

Based on data gathered from the study surveys, site visits, and interviews, as well as identified best practices, the following recommendations are suggested.

### Communication Systems

- Standardize and implement redundant communication systems

### Collaboration/Representation

- Develop a clear, specific chain of representation for planning and operations with the inclusion of EMS, hospitals, emergency management, public utilities, and ancillary health services
- Share applicable disaster plans
- Reduce political barriers
- Address the lack of direct communication with EMS
- Incorporate use of dashboards

### Staffing/Volunteers

- Implement cross-state credentialing or Uniform Volunteer Act
- Monitor school closures for their impact on staffing levels
- Reassign staff from closed offices to assist other functions
- Provide guides or tools to assist out-of-area crews in finding locations
- Implement cross-state inspections/permitting for out-of-state EMS units

## Evacuation

- Re-evaluate the “triggers” that put in motion the decision for patient evacuations
- Pre-position evacuation equipment throughout facilities
- Regular training on evacuation by facilities
- Standardize patient evacuation policies between hospitals and EMS
- Standardization of bed type definitions between facilities needs to be a priority
- Standardize definitions for crucial terminology among local facilities, such as hospital bed types
- Consider early evacuation of hospitals and home health patients

## Transport

- Better use of multi-patient transport vehicles like the AmbuBus or other Bus-Stretcher Conversion vehicles
- Additional high-water rescue vehicles to aid in accessing and rescuing victims

## Training

- Cross-entity training and exercises, with specific measurable objectives
- Train/exercise routinely on evacuation procedures

## Supplies

- Increase transparency in needs and resource availability
- Strategic staging of disaster and evacuation equipment within facilities

## Generators

- Re-evaluate generator capacities and vulnerabilities

## Disaster Plans

- Include and harden research facility disaster plans

## Patient Tracking/Patient Records

- Establish parameters for minimum patient transport records
- Improve tracking of evacuated patients with use of a bar code system

## Disaster Injury/Illness Data Collection

- Support legislation to classify all injuries and illnesses resulting from declared disasters as reportable to public health, and to standardize the reporting of disaster related injuries



## CONCLUSION

Many of the issues that are identified were expected areas of improvement for a storm of this magnitude. Some of the issues can be attributed to the persistence of silos. We identified the “silo effect” on several different levels such as hospitals to EMS, hospital to hospital (particularly network to network), EMS to emergency management, and hospital to emergency management. Efforts within many of the facilities visited and groups interviewed is ongoing with the identification of gaps to reduce or alleviate some of the domino effect and to improve overall response and recovery.

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## APPENDICES

### Appendix A: List of Participants in Stakeholders' Meeting

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## Appendix B: Hospital and EMS Self-assessment / Site Visit Surveys

### Hospital Survey Questions

Instructions:

The American College of Emergency Physicians (ACEP) is conducting a study to identify lessons learned and best practices for preparedness and response during disasters. We are asking that you answer the following items based on your preparedness for, response to, and recovery from Hurricane Sandy. Please respond to each item, even if it is a “N/A” or “not known” response.

We believe you will benefit from participation in this project by learning from others who have experience similar challenges and events. Summary information from the project will be shared with all participants.

#### Hospital Information and Demographics:

- Facility Name:
- Survey contact:
- What type of hospital or care facility? (Check all that apply)
  - Network (list affiliated hospitals in area)
  - Public/Private
  - Independent
- Hospital Trauma Designation:
- Number of beds:
- Please summarize the impact that Hurricane Sandy had on your organization (narrative).

***If applicable, please answer each question in two parts; 1) at the time of the actual Sandy Response and 2) describe if it was changed and how afterward, and how.***

#### Preparedness:

- Does your facility participate in or use system information from local or state dashboards (interactive multiple entity information and resource status sharing system) e.g. WebEOC, EMSsystems)
  - Does your organization report this data to authorities to populate Regional dashboards?
  - Does your organization exercise your response processes with them?
- What local, state or federal regulations/laws were a hindrance in your Hurricane Sandy response?
- Did your organization have a written disaster plan prior to Hurricane Sandy?
  - Did the disaster plan specifically address hurricane/flood?

- Was the disaster plan followed?
  - Describe how it worked and how it was improved
- How has your experience with prior disasters influence your response to Hurricane Sandy?

### Hospital Operations:

#### **DECOMPRESSION & SURGE:**

- Did your organization try to decompress its census immediately prior to Hurricane Sandy?
  - If so, what percentage of patients were you able to discharge before the storm?
- What is your planned maximum capacity for surge? Please describe
- If you reduced your census, what was the trigger to initiate the process?
  - Was the decision timely?
  - What will you do in the future to improve the process?
- How does your organization meet surge demand? (E.g. contingency, repurpose, etc.)
- Did you use alternate care areas within the hospital? (e.g. cafeteria, lobbies, halls) What regular hospital services were cancelled? (E.g. elective surgeries, wellness classes etc.)
- Please list the number of in-patients when at highest census by source:
  - Other hospitals
  - Home care (chronic care)
  - Nursing homes
  - Patients Clinics, such as dialysis and methadone clinics
  - Patients mental health clinics
  - Patients local emergency or homeless shelters
- Did you provide medical services to shelters?

#### **DISASTER ETHICS:**

- Describe ethical challenges your organization faced around the time of Hurricane Sandy.
- Was your organization required to use alternative practices or standards of care during Hurricane Sandy (e.g., if usual ER protocol is to insert IV into every patient, during disasters only patients most likely to need IV will get IV to save resources or staff time) (e.g. Contingency Standards of Care, or Crisis Standards of Care) Which ones?
- Describe any necessary, “just-in-time” (JIT) retraining required due to alternative procedures required due to shortages.

#### **SPECIAL NEEDS:**

- Were plans that were written prior to Hurricane Sandy activated to provide care for special needs & vulnerable populations?
  - If so, have they been changed after Hurricane Sandy?
  - If changed after Hurricane Sandy, how and why?
- If no plans of this type were in place, have any been written since?

#### **PATIENT TRANSFER AND EVACUATION:**

- Did your organization participate in a partial or full evacuation?
  - Did your organization receive evacuated patients from other facilities?
  - If you received patients evacuated from other facilities, how many?
- If your facility evacuated, describe your facility's triage process? How were patients prioritized?
- How does your facility triage patients?
  - How are those criteria communicated to hospitals or others?
  - What were the challenges of using that triage system?
- Were all evacuated patients moved with their medical records?
  - Were most records hard-copy or in an electronic format?
  - Were there issues with compatibility of electronic health record systems?
    - If so, please describe.
- Does your evacuation plan attempt to keep patients within your own hospital system?
  - If so, please describe any issues.
- What method did you use to track patients that remained and were moved within your facility, transported to another facility within your system, and/or transported to non-affiliated hospitals?
- What patient information was sent with evacuated patients?
  - How was the PI tracked?
    - Was barcoding used?
    - If so, was barcoding successful or unsuccessful? Why?
- Does your facility have paper charts available in case of power/IT loss?
- During and/or the after Hurricane Sandy, did your organization receive patient that were transferred unnecessarily?
  - If so, what could have been done better?
- Other than ambulances, what forms of patient transportation did you use during Sandy? (e.g. bus, ambulette, taxi)
- Does your hospital have Memorandums of Agreement (MOA) with EMS or non-emergency ambulance companies for evacuation?
  - Did you access those services documented in the MOAs during Hurricane Sandy?
- Do you have coordinated, predetermined destination facilities for patients?
  - Were these destinations outside of the impact zone?
  - Where specifically were they?
- Were there sufficient transport assets for your needs?
- What communication methods were used with EMS and transport assets?
  - Was there one individual or department assigned to this task?
  - If so, which one/who?

#### **Communications:**

- Did your facility utilize a public information officer? What specifically were they tasked with before, during and after the storm?

- Were there public information announcements in local or state media about instructions regarding hospital services after the storm? E.g. closures, routes, mold, safety etc.? Please describe the announcements.
- Does your organization use social media on a day-to-day basis? Did your organization use social media during Sandy?
- What types of media were used to contact staff? What types were successful/not so successful?
- What are your organization's plans for accessing medical records during power/IT failure? If your organization uses an Electronic Health Record (EHR), what are backup plans?

### Leadership, Organization and ICS:

- Did your facility utilize Hospital Incident Command System (HICS) models during Sandy? Please describe.
- Does your organization have an Emergency Manager? Is the Emergency Manager position a full time equivalent? If it is not full time, what percentage of time does it represent? Was the Emergency Manager on site for Sandy and what position in HICS did they fill?
- What Emergency Management training (e.g.: IS400) and credentials has your Emergency Management staff received?
  - Who is your senior-most emergency management professional?
  - Please attach an IS flowchart for your facility.
- Were staff leadership roles filled with trained (HICS and disaster) personnel?
- Please describe any opportunities for improvement regarding leadership's knowledge of disaster funding and emergency planning. Was your facility represented at the local, regional or state level Emergency Operations Center (EOC)?
  - If so, was the representation "in person" at the EOC or via other communication?
- Did you request any support from local, state or federal resources?
  - What did you request and from whom?
- What challenges or barriers arose between your organization, local, or state and federal resources and leadership?
- What could be done address political and organizational cultural barriers to collaborating in emergency planning and disaster response?
- Did you complete an after action report?
  - If so, was it distributed internally and/or to Disaster Management outside your facility?
  - Please attach a copy of your report if possible.
  - Please attach a copy of your current disaster plan if possible.

## Staffing and Resources:

### **HOSPITAL SERVICES:**

- Did your facility experience any damage?
  - If so, please describe specific locations of storm damage within your facility and how it inhibited operations and how was it addressed?
  - Flooding? How long?
- Internet outages? How long?
- Power Outages? How long? If so, were backup generators used? Effective? What services were lost under generator power? Flashlights available?
- Were there any issues with fuel for the generator(s), Oil? Maintenance or repair?
- How long can your organization continue operations if outside supply of the following were interrupted? Water? Food? Medications? Supplies? Linens? Power?
- Gas/Heating outage? Why? How long?
- Water outages? Plan for water re-supply?
- Medical Gasses? Why?
- Did you track resources on hand? Was this process altered during Hurricane Sandy?
- Were the elevators functional during or directly after Hurricane Sandy? If not, what was the reason for the malfunction? How long? How were patients moved during this time?
- Did medications need to be rationed? Please describe how these decisions were made?
- Was Methadone available? If not, what was the contingency?
- Was dialysis service available? Did your facility provide it? Was there a surge in dialysis related issues during and soon after the storm?
- Was any attempt made to harden your facility? Lock downs? Increased Security? Please describe.

### **STAFF AND VOLUNTEER SUPPORT:**

- How many total employees do you have?
- How many employees are normally on duty?
- Please describe any Hurricane Sandy related staffing shortages in the following areas (if any):
  - Nurse shortage
  - Physician shortage
  - Maintenance staff shortage
  - Dietary staff shortage
  - Security staff shortage
  - Volunteers shortage
  - Lab staff shortage
  - Ancillary staff shortage
  - Support services
- Did you increase/decrease duty staff in relation to the storm? What percentage?



- What support programs or policies did your organization provide to increase staff's willingness to work & support morale around the time of Sandy? Childcare? Pet Care? Activities?
- How did the storm physically hamper employee's access to work?
- How many staff were absent due to dual employment? Was this anticipated?
- Do you have a personnel plan addressing employee sleep, food, time off (rotation), family needs and safety, stress and PTSD etc.? If so, was it used/effective? What will you change after Sandy?
- Did outside volunteers present to offer assistance? How many were used? How many were turned away?
- What is your organization's plan for volunteer management (within your org/hospital, in hospital affiliated other sites, or elsewhere? What are credentialing requirements during emergencies & during normal circumstances? What requirements are needed for clinicians etc. to volunteer?

### Recovery, Further Planning:

#### **COMMUNITY COLLABORATION:**

- Describe the extent to which your organization participates in other multi-stakeholder collaborations and partnerships that increase your organization's ability to respond during emergencies?
- Do you embed an EMS representative in your EP planning group? Incident Command Center?
- Are other community related services represented in your EP process? Incident Command Center?

#### **BUSINESS CONTINUITY:**

- Does your organization have a plan for business continuity?
- Is there anyone in your facility who is trained or familiar with FEMA reimbursement?
- Have you sought FEMA reimbursement? What was your pathway for application for FEMA funding? Did you receive it?
- What difficulties or concerns does your organization have regarding FEMA reimbursement?
- What could be done to address political and organizational cultural barriers to collaborating in emergency planning and disaster response?
- Did your organization complete a comprehensive hazard vulnerability analysis prior to Sandy? Was the HVA revised after Sandy?
- Please describe any financial issues that you encountered due to:
  - Decreased census during and after the storm
  - Counseling and medical treatment of staff for mental and physical health issues (including stress and PTSD)
  - Damage or loss of medical equipment

- Issues with insurance billing regarding patient transfers, evacuation and/or tracking
- Damage to computer and other health information systems
- Decreased staff productivity
- Please describe any impact on staff in the form of:
  - Increased number of days of sick leave
  - Increased staff attrition after the storm
  - Increased patient census
  - Increased staff mental and physical health issues (including stress and PTSD)

## EMS Survey Questions

Instructions:

The American College of Emergency Physicians (ACEP) is conducting a study to identify lessons learned and best practices for preparedness and response during disasters. We are asking that you answer the following items based on your preparedness for, response to, and recovery from Hurricane Sandy. Please respond to each item, even if it is a “N/A” or “not known” response.

We believe you will benefit from participation in this project by learning from others who have experience similar challenges and events. Summary information from the project will be shared with all participants.

### EMS Information and Demographics:

- What type of EMS? (Government, private, hospital, volunteer, fire, etc.)
- Please list the names and titles of those participating in the completion of this information.
- Where is your EMS located? Number of Stations?
- Please describe your service area.
- How many employees? Levels? (clinical, dispatch, admin/support.)
- How many employees normally on duty?
- How many increased (if any) on duty in relation to the storm?
- How many non-employee volunteers were used?
- Please describe specific locations of storm damage within your area and how it inhibited operations.
- How has your experience with prior disasters influenced how you handled Sandy?
- What was your organization’s major issues during the preparation, response, and recovery from Sandy? (narrative)

### Preparedness:

- How many times has your organization been involved in declared disaster? Which ones?
- How often do you drill? Live vs table top drills? What scenarios? How often specifically regarding hurricane/flood?
- Does your facility/EMS participate in or use system information from local or state dashboards? Drill with them?
- What local, state or federal regulations/laws were a hindrance in your Sandy response? (eg. certificates of need, jurisdiction, DEA 222's, cross state credentialing, etc.)
- Did you have a written disaster plan prior to Sandy? Did it specifically address hurricane/flood? Was it followed? Describe how it worked and how it will be approved.

### Leadership:

- Who coordinated transport assets?
- Did you experience internal or external factors that affected patient destination decisions? If so, what were they?
- Did your organization have an Incident Management System in place? When/did your organization activate EOC? How long was it operational?
- Was all leadership able to communicate/respond during the storm? Please describe any gaps.
- What role did your medical director have during the storm different from regular duties?

### Operations:

- Did you have any problems with hospital "patient parking"? How did you address it? Plans for addressing it in the future?
- Did you receive requests for transport in a timely fashion? If not, what would have worked better?
- What total % increase in calls for service? 911 only?
- Is your organization able to transport a patient from a 911 call to alternative destinations besides an ER? ....around the time of Sandy? ...now? (e.g., to a shelter or urgent care clinic)
- How many patients did you transport by ambulance that your organization feels could have been moved by alternative means? Examples of what kind of patients? What are transport alternatives?
- Were policies keeping patients within hospital systems during evacuation a challenge for EMS?
- How many calls were you unable to respond to due to the storm? Why?

- List the type and prevalence of responses during the period of the storm and the same during a comparable period prior to the storm, e.g., most prevalent for a one week period during the storm-nursing home transports (includes evacuation) = 567 Typical week pre-storm =47. Drownings next prevalent during storm =23 Typical week pre-storm = 2, etc.
- How do you usually complete patient care records? (paper, electronic, etc) Did this change during the storm? How?
- How are EMS staff tracked? Describe any required staff tracking procedure changes for the storm.
- Were there any Haz-Mat incidents specifically requiring EMS response? Please describe.
- Were there any periods that your EMS did not respond due to weather danger?
- Were there any gaps in law enforcement that affected security, operations or the safety of responding personnel?
- Were EMS personnel assigned to shelters? If so, where, how many? Describe duties.
- Did any patient care require austere measures due to supply/personnel issues? Please describe.
- Describe any damage to your facilities that affected operations?
- Describe any damage to your emergency vehicles during the storm?
- Describe any issues with staff being able to report to work during and after the storm? How long was this an issue?
- Describe any issues obtaining fuel during and after the storm? How long was this an issue?
- Describe any issues obtaining replacement medical supplies during and after the storm? How long was this an issue?
- Were patients triaged during evacuations? Under what circumstances? Which triage system? By whom? Was it successful? If not, please describe ideas for improvement.

### Communications:

- Did you have appropriate communication with other EMS services, alternate transport groups, law enforcement, fire, public works, etc. Please describe whether this was direct communication (how?) and/or communication through IC.
- What type of communications were used (worked) (Cell, HAM, Satellite phone, Land-line, Radio etc.) What type were attempted but did not work? Why?
- How are units dispatched? Was dispatch disrupted? How?
- Did your facility/EMS participate in or utilize system information from local or state dashboards?
- Did/do you have access to “real-time” patient bed counts and local hospitals?
- How was communication between hospitals and transport assets? Was there one individual or department assigned to this task? Which one/who?
- Do you have specific contact persons at the hospitals? EOC? SOC? Who or what department at the hospital?
- Is there an EMS liaison assigned to the hospital EOC, Local EOC or other levels?

- Did you receive requests for transport in a timely fashion? Please include both transport for evacuation purposes and 911 responses. If not, what would have worked better?
- Do you have an assigned Public Information Officer? Were they used? What circumstances?
- How did you manage patient family inquiries? (e.g., location, condition, etc.)

### Staffing and Resources:

- Do you have a personnel plan addressing employee sleep, food, time off (rotations), family needs and safety, stress and PTSD etc. If so, was it used/effective? What will you change after Sandy?
- Please describe any issues with re-supply of linens, drugs, equipment, fuel, maintenance etc.?
- Did you experience requests to assist from volunteers? If so how were they used? Did you (how?) verify credentials?
- Were EMS resources staged prior to the storm impact? Which ones? Where? Why?
- Were mutual aid plans used? With what other services? Why or why not?
- What is (was) the trigger for employing mutual aid? Was this according to previously established plans?
- Did your EMS request additional assets from the local EOC/state or federal resources? What assets? If so, were they provided in a timely fashion?
- Were any special arrangements needed for housing, hygiene or feeding of stranded or extra staff? How was this accomplished?

### Recovery, Further Research and planning:

- Did you complete an after action report or other form of incident report? Was it shared internally? To Disaster Management outside your facility? Who all was it shared with?
- Was CISD offered? Needed? If so, how many used it?
- Describe the changes you have or intend to make to your pre-Sandy disaster plans.
- Have you submitted for FEMA reimbursement? Have you been paid by FEMA? Barriers?
- What type (for what) of reimbursement was requested?
- Did you have any insurance claims by personnel for storm related issues? E.g. health, injury, personal vehicle, workers comp etc. How many? For what?

### Appendix C: Site Visit Team Members

Patrick R. Elmes, EMT/P (Ret.)  
Manager, EMS and Disaster Preparedness  
American College of Emergency Physicians  
Dallas, Texas

John Rinard, BBA, MSPCI  
Senior Training Specialist  
Texas A&M Engineering Extension Service (TEEX)  
Bryan/College Station, Texas

Melanie Guluxin, RN  
Emergency Department Manager  
Allina Health, Unity Hospital  
Minneapolis-St. Paul Area, Minnesota

Anjanette Hebert, CHPA, CHEP  
Director of Security, Safety & Emergency Preparedness  
Lafayette General Medical Center  
Lafayette, Louisiana

Rick Murray, EMT-P  
Director, Dept of EMS and Disaster Preparedness  
American College of Emergency Physicians  
Dallas, Texas

Roy L. Alson, MD, PhD  
Associate Professor, Emergency Medicine  
Wake Forest School of Medicine  
Medical Director for Forsyth County EMS  
Medical Director for the NC SMAT program  
Winston Salem, North Carolina

Elisa Stott, CHEP  
Network Emergency Preparedness Coordinator  
Safety Manager at Community Health Network  
Indianapolis, Indiana

Aimee Binning, EMT-I  
Albany County Emergency Manager/DHS Coordinator  
Laramie, Wyoming

Knox Andress, BA, AD, RN, FAEN

Emergency Preparedness and Education Coordinator for the Louisiana Poison Center

Assistant Director with the Department of Emergency Medicine

Louisiana State University Health Sciences Center

Shreveport, Louisiana

## Appendix D: Hospital and EMS Participant Locations

### Hospitals (total respondents: 77)

#### Responded to online survey

Chesapeake Regional Medical Center	Chesapeake, VA 23320
Gouverneur Health Medical Center	New York, NY 10002
Lahey Hospital & Medical Center	Burlington, MA 01805
Baystate Medical Center	Springfield, MA 01199
Gettysburg Hospital	Gettysburg, PA 17325
Harvard Vanguard Medical Assoc	Boston, MA
University of MD/Upper Chesapeake	Bel Air, MD 21014
St. Luke's University Health Network	Bethlehem, PA 18015
North Shore University Hospital	Manhasset, NY 11030
Boston Medical Center	Boston, MA 02118
St. Joseph Hospital	
Waynesboro Hospital	Waynesboro, PA 17268
Inspira Health Network	Woodbury, NJ 08096
Holy Family Hospital	Methuen, MA 01844
VCUHS (Virginia Commonwealth Univ	Richmond, VA 23298-0066
Strong Memorial Hospital	Rochester, NY 14642
Mercy Anderson Hospital	Cincinnati, OH 45255
University of Maryland/St Joseph Hospital	Towson, MD 21204
Our Lady of Lourdes Medical Center	Camden, NJ 08103
Holly Bartimus Cooper University Hospital	Camden, NJ 08103
Rhode Island Hospital	Providence, RI 02903
Miriam Hospital	Providence, RI 02906
Newport Hospital	Newport, RI 02840
<i>Seven respondents did not provide location information.</i>	

#### Other Respondents (e-mail, phone, etc.)

Beverly Hospital	Beverly, MA 01915
Winchester Hospital	Winchester, MA 01890
Lahey Peabody Medical Center	Peabody, MA 01960
Addison Gilbert	Gloucester, MA 01930
Bay Ridge Hospital	Lynn, MA 01904
Lehigh Valley Hospital	Trexlerstown, PA 18087
St. Luke's University Health Network	Allentown, PA 18103
Glen Cove Hospital	Glen Cove, NY 11542
Plainview Hospital	Plainview, NY 11803
Long Island Jewish Medical Center	New Hyde Park, NY 11040



Southside Hospital	Bayshore, NY 11706
Catholic Health Service of Long Island	Rockville Centre, NY 11570
North Shore University Hospital	Boston, MA 02118
Inspira Medical Center	Woodbury, NJ 08096
Inspira Medical Center	Vineland, NJ 08360
Steward Health Care System	Boston, MA 02116
Holy Family Hospital at Merrimack Valley	Haverhill, MA 01830
Nashhoba Valley Medical Center	Ayer, MD 01432
Norwood Hospital	Norwood, MA 02062
Good Samaritan Medical Center	Brockton, MA 02301
UM Harford Memorial Hospital	Havre de Grace, MD 21078
Boston Medical Center	Boston, MA 02118
U of MD System	College Park, MD 20740

Participated in on-site Interviews

**Massachusetts**

Mass General	Boston, MA 02114
Tufts Medical Center	Boston, MA 02111
Brigham & Women's Hospital	Boston, MA 02115
Boston Children's Hospital	Boston, MA 02115
Beth Israel Deaconess	Boston, MA 02215

**New York**

Beth Israel Deaconess Hospital	New York, NY 10003
NY Presbyterian Lower Manhattan Hospital	New York, NY 10038
Sloan Kettering Cancer Center	New York, NY 10065
NYU Langone Medical Center	New York, NY 10016
North Shore Health System/Long Is. Jewish	New Hyde Park, NY 11040
Coney Island Hospital	Brooklyn, NY 11235
Bellevue Hospital	New York, NY 10016
Manhattan VA	New York, NY 10010

**Northern/Coastal New Jersey**

Bayonne Medical Center	Bayonne, NJ 07002
Christ Hospital	Jersey City, NJ 07306
Hoboken University Medical Center	Hoboken, NJ 07030
Ocean Medical Center	Brick, NJ 08724
Meadowlands Hospital Medical Center	Secaucus, NJ 07094
Palisades Medical Center	North Bergen, NJ 07047

**Maryland/District of Columbia**

Medstar Washing Hospital Center	Washington, DC 20010
Medstar Health Southern Maryland	Clinton, MD 20735
Medstar Montgomery Medical Center	Olney MD 20832
Medstar Georgetown University Hospital	Washington, DC 20007
Medstar Good Samaritan Hospital	Baltimore, MD 21239

**EMS Organizations (total respondents: 24)**

Responded to Survey

Rhode Island Department of Health	Providence, RI 02908
Bronx, Nassau, Suffolk New York (Hunter Amb)	Bronx, NY 10459
Brooklyn College, CUNY	Brooklyn, NY 11210
Montefiore Medical Center	Bronx, NY 10467
Little Neck-Douglaston Community Amb Corps	Little Neck, NY 11363
Rockaway Point Volunteer Fire Department	Breezy Point, New York 11697
Lindenwood Volunteer Ambulance Corps	Ozone Park, NY 11417
Throggs Neck Volunteer Ambulance Corps	Bronx, NY 10465
Catholic Health Services of Long Island	Rockville Centre, NY 11570
Bensonhurst Volunteer Ambulance Service	Brooklyn, NY 11228
Flatlands Volunteer Ambulance Corps	Brooklyn, NY 11234
Throggs Neck Volunteer Ambulance	Bronx, NY 10465
Ctr for Emer Med Services, North Shore-LIJ	Syosset, New York 11791
Woodhaven-Richmond Hill Vol Amb Corp	Queens, NY 11421
Richmond Univ Med Ctr of Staten Island EMS	New York, NY, 10310
New York Hospital Queens EMS	Flushing, NY, 11355
Whitestone Community Ambulance	Flushing, NY 11357

Participated in On-site Interviews

**Boston**

EMS	Boston, MA 02118
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**New York**

Park Slope Volunteer Ambulance Corp.	Brooklyn, NY 11215
REMSCO (New York Regional EMS Council)	New York, NY 10115
Fire Department of New York	Brooklyn, NY, 11201
Transcare EMS	Brooklyn, NY 11201

**North/Coastal New Jersey**

MONOC (Monmouth Ocean Hospital Service Corp)

Neptune, NJ 07753

**Maryland**

Maryland Institute for EMS Systems

Baltimore, MD 21201

## Appendix E: Ancillary Services Interview Questions

- Was your business or delivery of services affected during the Hurricane? (such as flooding, loss of power, structure damage, inability for employees to make it to work, to restock inventory, or to deliver services or supplies to customers)
- Which of the following affected your business?: (structural damage, flooding, loss of power, loss of other utilities (water-sewer-gas) or other)
- How long did the above affect your business? (days, weeks, months)
- How long was your business closed during and after the storm?
- Was it closed from direct storm damage or was the area closed off by local officials?
- How long were your employees and/customers not able to reach your business?
- How soon were you able to resume normal operations like delivery of medical supplies, services, or pharmaceuticals to customers after the storm?
- How did your customers receive their needed medical supplies, services, or pharmaceuticals while your business was closed?
- Did you have agreements in place to transfer your customers to other resources while you were closed?
- What factors affected your ability the greatest to remain open and serve your customers during and after the storm?
- What actions, if any, have you taken since to storm that would help protect your business in the future from similar issues?
- Did you request disaster recovery assistance for your business through local, state, or federal disaster assistance programs? If so, did you receive adequate assistance?
- Were you requested to provide assistance in any way in the local disaster response by outside agencies? If so, was it local, state, federal, or faith-based organization?
- Did you have a formal disaster plan or COOP (Continuity of Operations) plan before the event and how have you changed your plan afterwards?

## Appendix F: Ancillary Services Participant Locations

### Ancillary Services Organizations (total respondents: 52)

#### New York

King Kullen	NY 11776	Pharmacy
Battery Park	NY 10280	Pharmacy
Promesa	NJ 07648	Methadone Clinic
Newton Timmerman	NY 10065	Pharmacy
Avalon Chemists	NY 10003	Pharmacy
Staten Island	NY 10301	Pharmacy
E&M Lindy	NY 11757	Pharmacy
Classic Pharmacy, Inc.	NY 10301	Pharmacy
Chateau Drug	NY 10023	Pharmacy
Halpern Pharmacy	NY 10010	Pharmacy
Waldbaum	NY 11004	Pharmacy
Care One Home Medical	NY 10029	Med Supply/Oxygen
Carl's Medical Gas, Oxygen and Nitrous Oxide	NY 10913	Oxygen Supply
Alpine	NY 11733	Medical Supply/Equipment
Narco Freedom, Inc.	NY 10451	Methadone Clinic
Beth Israel	NY 10038	Methadone Clinic
Trotta's Pharmacy	NY 10528	Pharmacy
Weiss Renal Dialysis Center	NY 10901	Dialysis/Kidney Center
E & E Pharmacy	NY 10452	Pharmacy
Wyckoff's Corner Pharmacy	NY 11201	Pharmacy
Borbas Pharmacy	NY 11214	Pharmacy
Bridge Apothecary	NY 11201	Pharmacy
Todt Hill Pharmacy	NY 10306	Pharmacy
Throggs Neck Pharmacy	NY 10465	Pharmacy

#### New Jersey

Bayview Highlands	NJ 07716	Pharmacy
Renal City of Brick	NJ 08736	Dialysis/Kidney Center
Kidney Life Center	NJ 07107	Dialysis/Kidney Center
DCI	NJ 08902	Dialysis/Kidney Center
Fresenius Medical Care	NJ 07114	Dialysis/Kidney Center
Fresenius Medical Care	NJ 07304	Dialysis/Kidney Center
McCarthy Resp. Services	NJ 08210	Medical Supply/Oxygen
Monroe Medical Supplies	NJ 08512	Medical Supply
Diagnostics Direct	NJ 08247	Diagnostics/Supply
All Care Medical	NJ 07207	Medical Supply
Pesh Medical	NJ 07021	Medical Supply
Rands	NJ 08753	Medical Supply

East Orange Substance Abuse Treatment Prog	NJ 07018	Methadone Clinic
Somerset Treatment Services	NJ 08876	Methadone Clinic
Strathmore	NJ 08853	Methadone Clinic
New Brunswick Counseling	NJ 08901	Methadone Clinic
Burlington Comprehensive Counseling	NJ 08060	Methadone Clinic
Booker Outpatient Dialysis Center	NJ 07701	Dialysis/Kidney Center
Karing With Kindness	NJ 08221	Medical Supply

**Connecticut**

APT Foundation	CT 06511	Methadone Clinic
South Central Rehabilitation Center	CT 06519	Methadone Clinic
Liberation Programs	CT 06850	Methadone Clinic
A2Z Home Medical Supplies	CT 06357	Medical Supply
Northeast Medical Equip.	CT 06475	Medical Supply
Collins Medical Equip.	CT 06825	Medical Supply
Med-Tech	CT 06477	Medical Supply
Grieb's Darien	CT 06820	Pharmacy
Lupe's Drug Store	CT 06606	Pharmacy