Omary Perez
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Tornado in Joplin, Missouri: A Case Study

Introduction

A tornado in Joplin, Missouri occurred on a late Sunday evening of May 22, 2011. The tornado was one of the deadliest in United States history, killing 161 people, leaving nearly 2,000 injured and 9,200 displaced, and resulting in the destruction of St. John's Regional Medical Center hospital.[1,3] This disaster led to St. John's hospital "hardening" the new structure with infrastructure enhancements such as window systems designed to withstand 250 mph winds, concrete roofs, fortified "safe zones" on every floor and half-buried generators away from the main building.

Facts of the Case

The tornado twister, rating as the most intense on the Enhanced Fujita (EF) Scale at EF5, hit the grounds of Joplin, Missouri at 5:41 PM local time for 32 minutes and traveled for about 13 miles.[2,4,5] That evening, 161 people died as a result of the storm. The tornado wrecked 553 businesses, destroyed over 4,000 and wrecked more than 8,000 buildings, including the major hospital – St. John's Regional Medical Center hospital and other critical public facilities.[2,3] The total financial loss after the disaster mounted to $2.8 billion in damages.[2]

St. John's hospital had 183 patients during the night of the disaster.[5] The hospital took a direct hit from the tornado and every window in the building was blown out, the top two floors were shredded away from the building.[5] First responders on shift that night had limited time to pull patients away from their rooms and into the hallways before the storm struck, and 6 people died in the event.[5] Once the tornado passed, there were dilemmas that the structure might collapse and the building was evacuated shortly after.[5] Subsequent reports claimed the entire hospital structure had been moved four inches from its original foundation.[5] Considering most of the hospital structure had to be rebuilt, the proposed plan of restored business continuity was projected to cost a total of $6.6 million.[6]

Epidemiological aspects of the event

Two and a half years after the disaster, a study was conducted using a random digit dialing (RDD) sample of residents in Joplin, Missouri and participants were interviewed by landline using 2 surveys; Survey 1 was conducted approximately 6 months after the tornado and Survey 2 was conducted approximately 2.5 years after the storm.[7] Logistic regression models were calculated to predict probable posttraumatic stress disorders (PTSD) and current depression for participants in both surveys.[7] The logistic regression models included gender, age, education, and

tornado impact as predictors for the study. For Survey 2, the same model was employed but with an added social support component.[7] Odds ratio was used as measure of association to report the probability of PTSD between participants in relevance to the different indicators used. The study findings revealed that while the number of people who had depression symptoms decreased by about 8%, PTSD increased by about 14%.[7] Survey results also indicated that low levels of social support heightened the likelihood of experiencing PTSD symptoms and feelings of depression 2.5 years after the tornado.[7] These results indicate that over a quarter of Joplin's tornado survivors were likely battling PTSD at the time of the study. Missing data in the study was calculated using the multiple imputation procedure.

Management of the event

After the tornado tumbled through the St. John's hospital, hospital workers used any method they could to take patients out to the parking lot for evacuation within 90 minutes of the incident.[1] Volunteers used school buses and pickup trucks to rush critical patients to nearby hospitals such as Freeman Health System and St. John's Hospital in Springfield (all roughly 1 mile away).[8] Some health workers operated despite having injuries of their own while others stepped away from the scene in shock.[8] Approximately 70 agencies provided ambulance services to the City of Joplin following the tornado.[1] However, as the nearby hospitals reached their capacity, patients were rushed to the parking lots of Home Depot and Lowe's where medical and Emergency Medical Services (EMS) personnel improvised due to the lack of medical supplies.[1] A lesson learned from this catastrophic event was the need for a reliable response operation. Many first responders self-dispatched to Joplin and initiated tasks without coordinating with local incident command.[1] This led to first responders searching some structures multiple times and this presented challenges for the incident command management team. Additionally, many responders lacked the equipment and training to conduct effective search and rescue operations safely.

Communications of the event

After the storm surge in Joplin, transmission poles, cellular towers, and power infrastructure were destroyed for the most part. St. John's hospital land lines did not work, nor did first responders' cell phones, and the hospital's radio system was also down.[8] This posed a major challenge for healthcare workers, first responders, key organizations, and volunteers to effectively communicate during the initial response. Communication remained limited until communications and power companies restored infrastructure.

Summarization

The tornado in Joplin was one of the deadliest natural disasters in US history. The storm surge killed 161 people and left nearly 2000 people injured; PTSD and depression symptoms were common among those who survived. The loss in damages amounted to $2.8 billion, and the plan to restore St. Johns Medical Center hospital was projected to cost a total of $6.6 million.

The necessity of an effective and reliable response operation for first responders to not self-dispatch to the disaster scene, effective training, and availability of rescue equipment are some of the lessons learned from this disaster.

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