



# NATURAL DISASTERS EFFECTS ON HEALTHCARE

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## Introduction

On September 20<sup>th</sup>, 2017 the island of Puerto Rico was directly impacted by Hurricane Maria, a category five storm. Unfortunately, the United States healthcare industry felt the impact of Hurricane Maria as well. Puerto Rico produces forty-four percent of the IV fluid bags used in the United States (Patino, 2018). Hurricane Maria directly impacted the production of IV fluids produced on the island. In turn, the U.S. mainland experienced a severe shortage in IV fluid bags. Unfortunately, natural disasters can occur unexpectedly.

Natural disasters can affect plant production and cause drug shortages, having to deal with drug shortages is becoming a routine in the pharmacy. Drug shortages can increase cost, delay patient care and can even compromise the care given to patients (Mark, 2000). Components for tackling drug shortages include identifying alternative therapies, working with suppliers and collaborating with physicians. Mark suggested examples of management and conservation strategies included par adjustments, centralization of inventory, repackaging into smaller dosage units, extending beyond-use dating when approved by the FDA, intravenous to by mouth administration conversion, discontinuing nonessential therapy, limiting use of product to uses supported by evidence, and using a different strength or size of product (Mark 2000).

When a natural disaster creates a drug shortage who is held responsible to communicate with medical institutions which drugs and adjunct agents have been affected? Lack of information being disclosed threatens the ability to properly plan for drug shortages. Traynor, 2017 investigated whether the United States Food and Drug Administration (FDA) accurately disclosed the list of critical hospital medications in short supply caused by Hurricane Maria devastating Puerto Rico. Traynor believed that the FDA was not disclosing the list of critical hospital medications that were in short supply due to Hurricane Maria. It is vital to disclose information about an area that has been affected by a natural disaster to medical institutions in order to maintain and control any shortages that may be encountered.

“Facing the Shortage of IV Fluids - A Hospital-Based Oral Rehydration Strategy” was a study on the shortage of intravenous fluids the U.S. faced after Hurricane Maria devastated the island of Puerto Rico. Patino, 2018 investigated and confirmed that emergency departments are the primary consumers of intravenous fluids in the U.S. Patino, 2018 was able to conclude that the shortage of intravenous fluids in the United States was caused by Hurricane Maria devastating the island of Puerto Rico. Puerto Rico accounts for nearly fifty percent of intravenous fluid bags used in the U.S. Patino, 2018 shows how a hospital is able to respond to a massive natural disaster that affected the entire U.S. Patino, 2018 displays the rehydration protocol that was created in response to a severe saline shortage after Hurricane Maria.

What will be the emergency response to a drug shortage of frequently used medications throughout the healthcare system and the anesthesia specialty? It is crucial to investigate the emergency protocols that need to be implemented when the United States faces a catastrophic natural disaster. When a natural disaster occurs how does that affect the U.S. healthcare industry, what shortages occur and what medical specialties are affected? Are current healthcare protocols able to withstand an unexpected shortage caused by a natural disaster? This research study will focus on the methods that were created by medical institutions in order to compensate for the drug shortages that occurred due to natural disasters. This study will question who should be responsible for implementing emergency protocols for drug shortages and should medical institutions already have an emergency protocol implemented for drugs that are frequently used in anesthesia in order to be proactive.



## Methods and Materials

Participants in the study included patients with mild dehydration, acute gastroenteritis, pregnancy-related hyperemesis and mild viral upper respiratory infection or pharyngitis. The study was conducted at the fifty-nine bed Emergency Department at Brigham and Women’s Hospital. The Division of International Emergency Medicine and Humanitarian Programs of the Department of Emergency Medicine was given the task to create an oral rehydration protocol to respond to the IV-fluid supply shortage that occurred after Hurricane Maria (Patino, 2018). This study immediately identified who was responsible for developing an emergency protocol. This is the approach that should be adopted and developed for the anesthesia specialty.

Materials included were: antiemetics, pain medications, benzocaine, menthol lozenges, acetaminophen, ibuprofen, pitchers for fluids, flavored oral electrolyte solution, sports drink, juice, straws, medicine cups, and a tracking sheet to keep track of the amount of fluids taken in (Patino, 2018). The Division of International Emergency Medicine and Humanitarian Programs aimed for treating the underlying cause by using a multi-modal approach to dehydration.

The team created a target hydration goal that each patient should meet. Target times were as follows (Patino, 2018):

- 1000 ml remaining: 0 min (0 min)
- 750 ml remaining: 25 min (40 min)
- 500 ml remaining: 50 min (1 hr 20 min)
- 250 ml remaining: 1 hr 15 min (2 hr)
- 0 ml remaining: 1 hr 40 min (2 hr 40 min)

The procedure created was as followed (Patino, 2018):

1. Place an oral rehydration fluids order into the chart; add antiemetic, pain control, or both if needed. Consider benzocaine or menthol lozenges in addition to acetaminophen or ibuprofen. If there is significant nausea or pain, wait 20 min after medications to begin drinking (Patino, 2018).
2. The order will prompt the nurse to bring the patient two 500-ml pitchers of an electrolyte solution, sports drink or juice. The nurse instructed the patient to drink two large sips or 30 ml every 3–5 min. The target hydration goals was explained to the patient and a tracking sheet was provided. The nurse drew lines on the pitcher for target volumes (Patino, 2018).
3. Troubleshooting: if oral intake was not sufficient, determined why and given additional antiemetic, pain control, or both. If taste was the problem and the dehydration was mild, alternative liquid options were offered (Patino, 2018).

## Discussion/Conclusion

Puerto Rico is home to forty-nine FDA-approved pharmaceutical companies. When Hurricane Maria devastated the island the pharmaceutical companies brought drug manufacturing to a halt. This impact trickled to the U.S. mainland and many medical institutions were being impacted. Hurricane Maria has proven that natural disasters can create a drug shortage. The response by the ED team at Brigham and Women’s Hospital is an example of how medical institutions should have a team that is readily available, educated and trained on developing emergency protocol responses on heavily used drugs. Realistically, we cannot prepare for every single drug that there could possibly be a shortage on. But, the anesthesia specialty can be proactive and start developing plans and alternative medications to be used in case of a shortage. For example, if there is a shortage on Propofol, Etomidate has already been studied and approved as being an effective alternative to a Propofol shortage (Romito, 2015). In the Anesthesia specialty a drug shortage could severely affect patients who are already immunosuppressed. At the very least there should be an emergency protocol for special patient populations such as, oncology patients. (Rider, 2013) found that the increased number of drug shortages affected vulnerable populations such as, the critically ill and oncology patients. In this study the drug shortage was able to reveal that a lack of therapeutic alternatives in critically ill and oncology patients impacted patient safety and treatment outcomes the most (Rider, 2013). Overall, I believe that the anesthesia specialty should be proactive and create protocols for major drugs that come from Puerto Rico in order to be prepared in case a natural disaster occurred.

## Results

The results include a hospital ED team that developed an oral rehydration protocol for patients that were admitted to the emergency department with mild dehydration. IV-fluid use by volume decreased by just over thirty percent in the first week after the oral hydration protocol was distributed throughout the hospital (Patino, 2018). Three weeks after protocol implementation, the fraction of ED patients with IV-fluid orders decreased by fifteen percent (Patino, 2018). In the end, the newly created oral rehydration protocol ended up being implemented throughout the entire hospital. A specific patient population was identified, a team was held responsible for developing a new protocol and resources readily available were used in lieu of the I.V. fluid bags. There was a systematic approach done that proved to be reactive but could be proactive in the future. I believe that this is the approach that the anesthesia specialty should take in response to drug shortages that affect the anesthesia specialty.

## References

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## Pharmaceutical Companies Around the Island



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