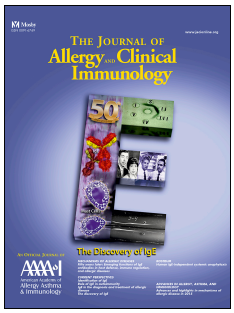
Accepted Manuscript



Natural Disasters – Impact on Physicians and Researchers

Javier Chinen, MD, PhD

PII: S0091-6749(17)32921-4

DOI: 10.1016/j.jaci.2017.11.033

Reference: YMAI 13181

To appear in: *Journal of Allergy and Clinical Immunology*

Received Date: 23 October 2017

Revised Date: 13 November 2017

Accepted Date: 24 November 2017

Please cite this article as: Chinen J, Natural Disasters – Impact on Physicians and Researchers, *Journal of Allergy and Clinical Immunology* (2018), doi: 10.1016/j.jaci.2017.11.033.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Journal of Allergy and Clinical Immunology

Paradigms and Perspectives

Natural Disasters – Impact on Physicians and Researchers

Javier Chinen, MD, PhD

Correspondence be addressed to:

Javier Chinen, MD, PhD

Immunology, Allergy and Rheumatology Division

Department of Pediatrics

Baylor College of Medicine

Houston, TX 77030

e-mail: jchinen@bcm.edu

ACCEPTED MANUSCRIPT

By early September 2017, Tropical Storms (TS) Harvey, Irma and Maria had hit the United States in a manner that has not ever been recorded. They flooded small towns and big cities in Texas, Florida and Puerto Rico, affecting people from all socio-economic levels. After a month, news from San Juan, PR reported that less than half of medical facilities were functionally operative. At the same time, wild fires in Northern California had displaced thousands of people from their towns, while earthquakes in Mexico City devastated neighborhoods and damaged historical places as well as new constructions.

Natural Disasters in the Biomedical Field

Institutions and people working in the biomedical field are not spared from suffering losses and property damages from these natural disasters. A recent National Academies report[1] highlighted the importance of the research community working together and building resilience in the face of natural disasters. During and because of TS Harvey, over fifty medical institutions at the Texas Medical Center in Houston, TX closed their doors for about a week, only allowing emergency and essential activities. Some of those personnel assigned for these essential functions were not able to leave their homes and go to work, most often due to flooding of major arteries of the city. When natural disasters occur, challenges are presented at different levels: city-wide, institutional and personal; affecting research activities or clinical services. In addition to structural damages to buildings, there might be losses of data, reagents, research animals, unique equipment and materials, and research projects set-backs. Individuals, clinicians and researchers, might suffer personal damages to their homes and their means of transportation, further delaying recovery efforts and normalization of activities. An estimate of the cost incurred due to TS Allison, which affected Houston in June 2001, gives an example of the devastation that might occur. The medical and research institutions at the Texas Medical Center in Houston suffered power failures and flooding that paralyzed research and clinical activities, reporting about 2 billion dollars in losses, representing over 30% of total damages due to the storm.[2,3]

Importance of preparedness

Although the total cost of a natural disaster might vary widely according to its magnitude and the size of the affected community, efforts to minimize potential catastrophic damages are obviously

justified. The most important lesson learned from natural disasters is that there needs to be preparedness plans in place.

After TS Allison, when it became clear that flood gates would protect building from water damage, a network of flood gates were built at the Texas Medical Center, primary and emergency power systems were secured, and water pumps were strategically placed. Drainage improvements in nearby bayous and creeks were made in cooperation with the City of Houston and Harris County. As a result, sixteen years later, TS Harvey caused minimal material damage to the medical institutions in the same area, even though it poured over forty inches of rain in four days, ten inches more than TS Allison.[4]

Disaster preparedness plans are necessary for the biomedical community to reduce damages, continue operations and facilitate recovery. The National Institutes of Health (NIH) provide with helpful information[5] to develop plans and address issues related to natural disasters. One major goal is to reduce the impact on research progress, including assistance with meeting grant deadlines when institutions hosting funded research activities are closed or in recovery. Following TS Katrina, Sandy and Harvey, the NIH issued supplemental funding due to the severity and devastating effect of these storms. Principal investigators should be encouraged to develop and update preparedness plans that include saving research data, samples and reagents, as well as research animals.

Clinicians- Allergy and Immunology

Hospital and clinical centers develop natural disaster plans to protect their facilities and continue helping those in need of inpatient and emergency medical care. Ride out teams provide with essential staff for those services. Priorities of these plans include alternating ride out teams and ensuring their well-being, as well as provision of food and supplies, such as medications and blood products.

While hospital and community leaders plan for potential consequences of natural disasters in large scale, every clinician should develop preparedness plans for their families, their offices and for their patients (See Table 1). Attention should be paid to the preservation of medical records. Table 2 summarizes general recommendations to be adapted to institutional or individual medical practices needs. In addition to considerations for patient care and medical records,

preparedness plans should address the preservation of allergen extracts and biological drugs used by allergists and immunologists in their medical offices.

Patients with chronic diseases who require daily medication, for example those with severe asthma, might leave behind medications when needing to evacuate in a hurry. Asthma patients are also at increased risk of developing asthma exacerbations during natural disasters. Increased exposure to fumes and smoke, and allergens are some of the factors associated with this increased risk. Indeed, during TS Harvey, an eight year-old boy with an asthma exacerbation was not able to receive treatment on time and died.[7] An example of the potential consequences of natural disasters relevant to allergists is the increased level of indoor mold spores that occur after a flooding, due to extreme and prolonged humidity and lack of air conditioning.[8] Damage to houses leading to inadequate environmental control would also increase concentration of outdoor allergens inside living areas. Every house or building with water damaged needs be inspected and fully surveyed, followed by mold remediation. Mold spores are one of the most common allergens that can trigger asthma flare ups and exacerbation of rhinosinusitis symptoms[9]. Patients with primary and secondary immunodeficiencies are more susceptible to mold infections and should not be involved on mold cleaning efforts.

Hypogammaglobulinemia patients receiving IgG supplementation should be advised to keep their infusion records available. Risks of infectious diseases, water-borne and/or insect-borne, are also increased during natural disasters due to discontinuation of routine city services, such as mosquito control and sewer management.

Researchers and Clinicians dedicated to Allergy and Immunology benefit from full awareness of the potential consequences affecting individuals and communities because of natural disasters. Preparedness plans are most significant to reduce the risk of damages and losses.

ACCEPTED MANUSCRIPT

ACCEPTED MANUSCRIPT

95

Clinicians	Patients
Emergency Kit for 3 days: Cell phone charger and/or power bank; emergency contacts; 2-3 change of clothes; water and non-perishable food; medications, toiletries; cash; books and other non-electronic games.	Encourage patients to have preparedness plans.
Natural Disaster Action Plan: Office building safety, safety of medical records, preservation of reagents, allergens extracts and medications	Make a list of patients that need daily and chronic medications. Provide instructions to fill and refill prescriptions to pharmacies when communications are limited.
Check information sources related to Natural Disasters	Anticipate shortages of essential medication and ensure access to them: epinephrine auto injector, asthma inhalers, IgG infusion
Develop, revise and update office procedures for Natural Disasters	Advise for increased risk of infections: exposure to sewer water, increase mosquitoes' infestation.
	Advise for increased exposure to environmental pollution and allergens.

96 **Table 1. Preparedness recommendations for clinicians and patients.**

97

98

ACCEPTED MANUSCRIPT

ACCEPTED MANUSCRIPT

- If using electronic medical records, backup all data as often as possible (e.g., daily or weekly) in an off-site electronic storage. (‘cloud’).
- For conventional paper medical records, including x-ray films: • Keep records on elevated shelves if flooding is anticipated • If there is water damage, start salvaging process promptly. Mold and bacteria might spread rapidly. • Reduce humidity and temperature • If records are deemed not salvageable and/or destroyed, ensure proper disposal, according to HIPAA guidelines to protect patient confidentiality. Keep a log of records destroyed and method of disposal.

Table 2. Considerations for Preserving Medical Records from Natural Disasters

ACCEPTED MANUSCRIPT

ACCEPTED MANUSCRIPT

References:

1. National Academies of Sciences, Engineering, and Medicine. 2017. Strengthening the Disaster Resilience of the Academic Biomedical Research Community: Protecting the Nation's Investment. Washington, DC: The National Academies Press. 2017.
2. FEMA and Harris County Flood Control District. 2011. Tropical Strom Allison Project: Off the charts
3. The University of Texas Health Science Center in Houston. The Impact of Tropical Storm Allison. https://www.uth.edu/media/featured/allison/allison-impact.htm Retrieved October 17, 2017
4. National Weather Service. Hurricane Harvey & Its Impacts on Southeast Texas from August 25th to 29th, 2017 http://www.weather.gov/hgx/hurricaneharvey. Retrieved October 17, 2017
5. NIH. NIH Extramural Response to Natural Disasters and Other Emergencies https://grants.nih.gov/grants/natural_disasters.htm. Retrieved October 17, 2017
6. CDC. Natural Disasters and Severe Weather https://www.cdc.gov/disasters/index.html. Retrieved October 17, 2017
7. Quin K. Boy suffering asthma attack during flood dies. http://abc13.com/boy-suffering-asthma-attack-during-flooding-dies/2366137/. Retrieved October 17, 2017
8. CDC. Mold after a disaster. https://www.cdc.gov/disasters/mold/index.htmlNIH
9. Barnes CS, Horner WE, Kennedy K, Grimes C, Miller JD, Environmental Allergens Group. Home Assessment and Remediation. J Allergy Clin Immunol Pract 2016; 4:423-431

ACCEPTED MANUSCRIPT