The Effect of a Hurricane on Limb Preservation in the US

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Statement of Purpose and Literature Review

Limb preservation practices represent a consuming enterprise in terms of direct and indirect health care costs, with frequent in-patient admissions, outpatient appointments and home nursing visits, for examples. These are services that might be expected to be disrupted with a natural disaster such as a hurricane.

Further, major health risks have been associated with weather events such as hurricanes with heavy rainfall affecting sewer and drainage systems leading to waterborne pathogens and disease, for example [1]. Previous publications have also tracked emergency room visits for patients after a major disaster who seek medical attention for conditions such as respiratory conditions, however, we are aware of no study specifically evaluating the implications of hurricanes as it pertains to the foot and ankle [2-3].

The objective of this investigation was to evaluate the effect of a hurricane on limb preservation outcomes.

Methodology

Admittedly this was a challenging question to investigate with many confounding variables, but we were able to identify a significant hurricane affecting a state with available public records. In August of 2012 Hurricane Isaac made landfall in a relatively localized portion of Southeastern Louisiana leading to the declaration of a state of emergency, and interestingly the temporary suspension of EMT licensing requirements in order to increase the medical assistance response to the storm. Individual county medical records were accessed to evaluate the rate of major amputation around this storm. Counties were categorized into being substantially affected vs. minimally affected by the storm based on rainfall (+/- 7 inches of rainfall; See Figure 1).

Specifically a retrospective review of the Healthcare Cost and Utilization Project (HCUP) on-line query system was utilized to review individual counties. Rates of limb amputation were obtained for the year before the hurricane (2011), the year of the hurricane (2012), and the following year (2013).

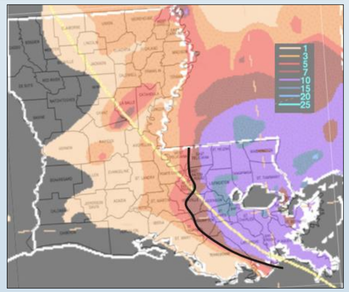
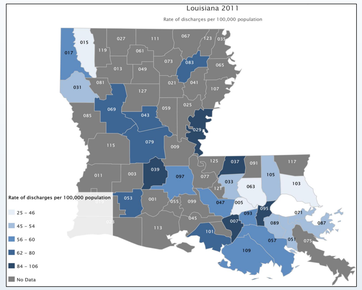
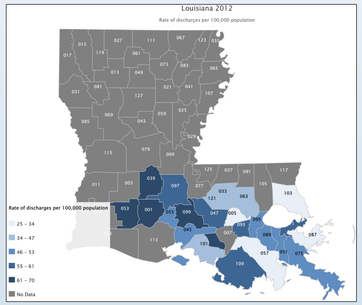
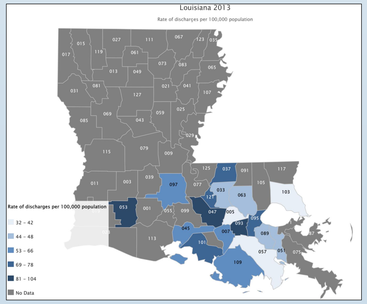


Figure 1. Map of Louisiana counties affected by Hurricane Isaac in 2012 with respect to rainfall. The black line depicts our dichotomization of counties based on this outcome.

Results







The rate of lower limb amputation per 100,000 decreased across the state of Louisiana from 2011 to 2012, but specifically decreased by 19.5% in the hurricane affected counties, but by only 13.5% in the non-hurricane affected counties.

The rate of lower limb amputation then increased from 2012 to 2013, but increased by 32.7% in the hurricane affected counties, but by only 18.4% in the non-hurricane affected counties.

Figures 2-4. Map of Louisiana counties affected by Hurricane Isaac in Louisiana from 2011-2013. The maps above demonstrate representative changes in amputations reported via rate of discharge per 100,000 population.

Discussion

The results of this investigation might demonstrate some early insight on the impact of how natural disasters affect patient access to medical services as well as clinical outcomes related to limb preservation.

The decrease in amputation rate from 2011 to 2012 might be hypothesized to be the result of patients being transferred from affected areas to the periphery and short-term lack of access to medical care. Whereas the increase in amputation rates from 2012 to 2013 might indicate more long-term effects of the short-term lack of access to medical care as well as potential changes to infrastructure that might have resulted as a result of the weather event.

It is our hope that this preliminary investigation leads to other investigations on the effect of natural disasters on access to foot and ankle care.

References

[1] Barbeau, Deborah N., et al. "Mold exposure and health effects following hurricanes Katrina and Rita." *Annual review of public health* 31 (2010): 165-178.
[2] H., et al. "Quantitative assessment of infection risk from exposure to waterborne pathogens in urban floodwater." *Water research* 48 (2014): 90-99.
[3] De Man, Stryckman, Benoit, et al. "Impact of Superstorm Sandy on Medicare Patients' Utilization of Hospitals and Emergency Departments." *Western Journal of Emergency Medicine* 18.6 (2017): 1035.