

Carbon Monoxide Poisoning during Hurricane Sandy in Affected New York State Counties

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Objective

1) To identify carbon monoxide (CO) poisoning in three most affected New York State (NYS) counties (Nassau, Suffolk, and Westchester) during and immediately after Hurricane Sandy with hospital emergency department (ED) chief complaint data reported daily to the New York State Department of Health (NYSDOH). 2) To explore the relationship between power outage and the numbers of CO-related ED visits (CO-EDs).

Introduction

CO poisoning is a leading cause of mortality and morbidity in disaster and post-disaster situations, when widespread power outages most likely occur (1, 2). The NYSDOH Syndromic Surveillance System receives daily ED visit chief complaint data from 140 NYS (excluding New York City) hospitals. Daily power outage data are available from the NYS Department of Public Service (NYSDPS). These data can be used to estimate the risk of CO-EDs and provide useful information for public health situational awareness and emergency response management during disaster events.

Methods

This was a retrospective study in which the daily CO-EDs were identified by searching CO-related keywords in chief complaints of the ED visits from the affected three counties during the Sandy period (October 29 – November 27, 2012). Data on daily maximum number of households without power during the hurricane in each of the three affected counties were obtained from NYSDPS. The correlation between CO-EDs and maximum number of households without power was estimated with a log-transformed linear regression model. A negative binomial model was used to examine the risk of CO-EDs by the maximum households affected by power outages each day during the month following Hurricane Sandy. Data were analyzed using SAS 9.3 and the p-value for testing statistical significance was set at 0.05.

Results

A total of 188 CO-EDs were identified in the three affected counties during the study period. Overall, the number of CO-EDs increased during the hurricane period. Coinciding with the power outage in the areas, the CO-EDs increase peaked at 3-4 days after the hurricane made landfall in NYS on October 29 (Figure 1). Statistical analysis showed that there was a significant correlation between the maximum number of households without power and the number of CO-EDs such that 53% of the variance of CO-EDs can be explained by the power outage ($p < 0.0001$). The risk ratio of CO poisoning was more than three times as great on days of significant power outage (i.e. when more than 200,000 households were without power), compared with days of insignificant power outage - defined as 10,000 or fewer households (Table 1). The higher the number of households without power, the higher the risk ratio of CO poisoning.

Conclusions

CO exposures can be identified with ED chief complaint data, and the risk of CO-EDs can be estimated using power outage data.

If ED data and/or power outage data are available in a timely base, they can provide valuable CO exposure information for situational awareness and emergency management during and after disasters. The study results also support that power outage is an underlying cause that indirectly leads to CO exposures. Education on proper use of alternative power and heating sources should be part of public programs designed to prevent future disaster-associated CO poisoning.

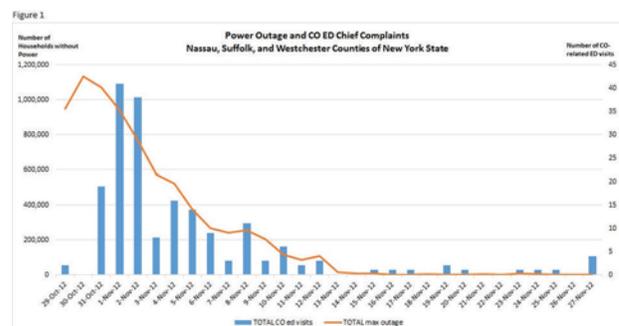


Table 1 Risk ratio of CO-related ED visits by daily maximum number of households without power during the period of Hurricane Sandy

Daily maximum number of households without power	Risk ratio*	95% Confidence Interval	p-value
10,000 - 99,000	1.55	0.66 - 2.44	0.0007
100,000 - 199,999	2.51	1.65 - 3.34	< 0.0001
200,000 - 480,000	3.14	2.31 - 3.97	< 0.0001

*Compared to days during which < 10,000 households were without power

Keywords

CO poisoning; event syndromic surveillance; disaster situational awareness; power outage; chief complaint

References

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