COACTION PUBLISHING

Finding time-of-arrival clusters of exposure-related visits to emergency departments in contiguous hospital groups

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Objective

To describe collaborations between North Carolina Division of Public Health and the Centers for Disease Control and Prevention (CDC) implementing time-of-arrival (TOA) surveillance to monitor for exposure-related visits to emergency departments (ED) in small groups of North Carolina hospitals.

Introduction

TOA surveillance methodology consists of identifying clusters of patients arriving to a hospital ED with similar complaints within a short temporal interval. TOA monitoring of ED visit data is currently conducted by the Florida Department of Health at the county level for multiple subsyndromes (1). In 2011, North Carolina's NC DETECT system and CDC's Biosense Program collaborated to enhance and adapt this capability for 10 hospital-based Public Health Epidemiologists (PHEs). The PHE program was established in 2003 for North Carolina's largest hospital systems. At the present time, PHE hospital systems include coverage for approximately 44% of the statewide general/acute care hospital beds and 32% of all ED visits statewide. We present findings from TOA monitoring in one hospital system.

Methods

This study examines healthcare records, for the time period January 1, 2010–June 30, 2011, from a North Carolina-based hospital system composed of three different hospitals for clusters of visits related to exposures. Visits were identified based upon the inclusion of terms in chief complaint data related to chemical, carbon monoxide, meningitis, food poisoning and other types of exposures. For each hospital, time series of visit counts from 1 hour cells, based on patient time-of-visit, were monitored using the past 60 days' cell counts as a baseline. Either a Poisson or a negative binomial distribution was assumed, depending on the baseline mean and variance for each hospital/hour cell. A p-value was calculated for the probability of at least as many visits as observed, and an alert was issued if this value was below 0.01, a threshold chosen to minimize the burden on the PHEs to investigate the alert.

Table 1. The distribution of counts of alerts for exposures

Counts of alerts	C2 only	TOA only	Both
Hospital A	3	1	1
Hospital B	8	4	3
Hospital C	7	6	4
All hospitals	11	12	6

For comparison with traditional NC DETECT methods, we also applied Biosense's modified C2 algorithm (2) to the daily exposure-related visit counts for this study.

Results

Table 1 shows how C2 and TOA alerting are complementary at the 3 study hospitals.

Line lists provide relevant information for each patient cluster. Table 2 gives an example of a TOA alert from a late morning cluster at a single hospital.

Table 2. Line-list of patient characteristics in a sample TOA cluster

Date/time	Age	Gender	Zip	Activity
11:28:00 am	6	F	27278	Food Poison*
11:28:00 am	9	M	27278	Food Poison*
11:29:00 am	27	F	27278	Food Poison*
11:30:00 am	5	M	27278	Food Poison*

Conclusions

TOA monitoring of exposure-related ED visits efficiently complements daily syndromic surveillance, finding additional clusters of potential interest. This method can be adapted to distributed as well as centralized alerting systems.

Keywords

Early event detection; exposures; time-of-arrival analysis

References

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