Bio-Surveillance and Enhanced Situational Awareness

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Objective

To report on surveillance and response activities during the 2006-2007 norovirus season in Boston.

Background

Syndromic surveillance has been used to detect variation in seasonal viral illnesses such as influenza and norovirus infection (1). Limited information is available on the use of a comprehensive bio-surveillance system, including syndromic surveillance, for detection and situational awareness during a sustained outbreak.

Methods

The Boston Public Health Commission (BPHC) monitors multiple data sources for disease activity in Boston. Data sources include reportable diseases and clusters, death certificates, inspectional service reports and the BPHC syndromic surveillance system.

Emergency department (ED) chief complaints are received daily by the BPHC syndromic surveillance system from all 10 Boston EDs. Three gastrointestinal (GI) syndrome groups are routinely monitored. Based on clinical information, ad-hoc syndromes can also be developed. Syndrome counts, stratified by hospital, neighborhood, age and gender, are reviewed daily by BPHC epidemiologists for parameters indicative of a cluster or a clinically significant event.

Death certificates are reviewed daily for unexplained causes and communicable diseases. Surveillance was enhanced in February 2007 to identify causes of death that could be associated with GI illness (i.e. dehydration).

Specimen collection for RT-PCR testing and genotyping was facilitated by BPHC throughout the norovirus season.

Results

On 12/8/2006, BPHC was notified by Boston EMS of a cluster of persons with GI illness requiring transport to a local ED. Between 12/1/2006 and 4/1/2007, there were 18 confirmed or suspected norovirus outbreaks among Boston institutions including colleges, daycare centers, and healthcare facilities compared to 2 outbreaks during this time period the previous year. The 1,327 confirmed or suspected cases identified most commonly reported vomiting and diarrhea. Outbreaks ranged in size from 8-438 cases without a point source identified. Death certificate surveillance identified 2 cases with gastroenteritis listed as a contributing factor. Both deaths were associated with the same confirmed outbreak.

All GI syndromes showed an increase in activity; however, only one (GI_4, defined as nausea, vomiting, and/or diarrhea) signaled the 12/8/2007 outbreak. Increases in the GI_4 syndrome group occurred citywide and among all age groups. Between 12/1/2006 and 4/1/2007, GI_4 visits averaged 94 a day (7.3% of all visits), compared to 75 visits a day (5.9% of all visits) during the same period the previous year.

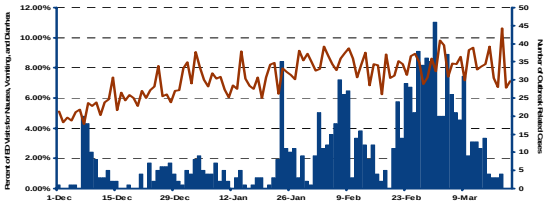

Figure 1 – Percent of emergency department visits for nausea, vomiting, and/or diarrhea (line) overlaid on cases reported from 13 of 18 outbreaks (1093 of 1327 cases) (bars).

There was a significant correlation between an ad-hoc dehydration syndrome (defined as dehydration) and GI_4 visits between 12/1/2006-1/15/2007 (p=0.004). In the previous year, these two syndromes did not correlate (p= 0.076).

Of 18 outbreaks, specimens from 9 (50%) were tested for norovirus with 8 having at least one positive test. Genotyping of strains from three outbreaks identified two newly emerging strains, a 2006 GII.4 Farmington Hills variant in one and GII.4 Minerva variant in the other two outbreaks.

Local public health response activities included health alerts for healthcare providers, infection control consultations, development of multi-lingual fact sheets and a norovirus pod cast for the general public.

Conclusions

The BPHC bio-surveillance system identified a large norovirus outbreak associated with two new GII.4 norovirus variants. Standard communication protocols with Boston EMS facilitated pre-hospital notification. Outbreak reporting and laboratory diagnosis and genotyping were critical in understanding and utilizing the syndromic information.

References

1. Heffernan R, Mostashari F, Das D, Karpati A, Kulldorff M, Weiss D. Syndromic Surveillance in Public Health Practive, New York City. Emerg Inf Disease;10:858-64

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