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Using GI Syndrome Data as an Early Warning Tool for Norovirus Outbreak Activity

Erin E. Austin*, Jun Yang and Tim Powell

Division of Surveillance and Investigation, Virginia Department of Health, Richmond, VA, USA

Objective

To assess the relationship between emergency department (ED) and urgent care center (UCC) chief complaint data for gastrointestinal (GI) illness and reported norovirus (NV) outbreaks to develop an early warning tool for NV outbreak activity. The tool will provide an indicator of increasing NV outbreak activity in the community allowing for earlier public health action to mitigate NV outbreaks.

Introduction

Norovirus infection results in considerable morbidity in the United States where an estimated 21 million illnesses, 70,000 hospitalizations, and 800 deaths are caused by NV annually (1). Additionally, NV is responsible for approximately 50% of foodborne outbreaks (1). Between January 2008 and June 2012, 875 NV outbreaks were reported to the Virginia Department of Health (VDH). To assist in detecting possible disease outbreaks such as NV, VDH utilizes the web-based Electronic Surveillance System for Early Notification of Community-based Epidemics (ESSENCE) to monitor and detect public health events across Virginia. ESSENCE performs automated parsing of chief complaint text into 10 syndrome categories, including a non-specific GI syndrome that serves as a proxy for GI illnesses like NV.

Methods

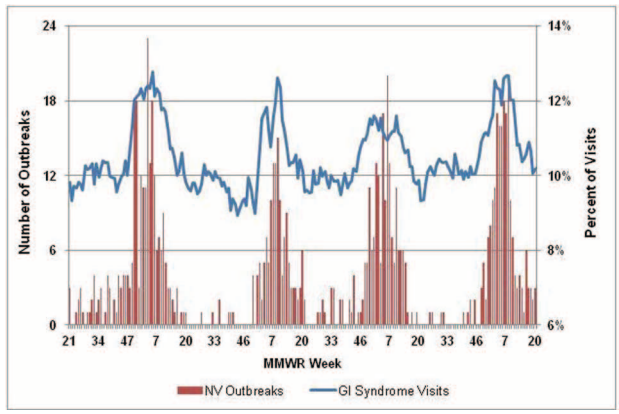
ED and UCC chief complaints parsed into the ESSENCE GI syndrome category were compared to confirmed and suspected NV outbreaks across four years. In this study, the analysis periods were defined as week 21 through week 20 of the subsequent year. GI syndrome visits as a proportion of all ED and UCC visits and NV outbreak counts were aggregated by week. Time-series, correlation, and logistic regression analyses were performed. Low NV outbreak activity weeks were defined as those with 4 or fewer outbreaks, and high NV outbreak activity weeks were those with 5 or more outbreaks. Based on low NV outbreak activity weeks, baseline and threshold values for the weekly percent of GI syndrome visits were calculated for each analysis period. Baseline calculation was the average weekly percent of GI syndrome visits from week 21 to week 31 and threshold value was baseline plus two standard deviations. Weekly percent of GI syndrome visits was compared to the threshold value to serve as an indicator of increasing NV outbreak activity.

Results

The study period was from May 18, 2008 to May 19, 2012 (Fig 1). A total of 1,425,728 GI syndrome visits and 804 confirmed and suspected NV outbreaks were analyzed. Weekly visits to ED and UCC facilities with GI syndrome were highly correlated with outbreaks of NV in the community ($r = 0.809$, $p < .0001$). Median and mean number of NV outbreaks per week were 2 and 4, respectively (range 0-23). NV outbreaks were more prominent during the winter months with peaks occurring between weeks 3-9. Median and mean percent of GI syndrome visits per week were 10.2% and 10.5%, respectively (range 8.9%-12.8%). Weeks with high NV outbreak activity were more likely to occur when the weekly percent of GI syndrome visits had surpassed the threshold value (OR =110.7, 95% CI: 31.9-384.8). On average, weekly percent of GI syndrome visits surpassed the threshold value 1.25 weeks prior to the start of high NV outbreak activity weeks (range 0-3).

Conclusions

These results support the use of syndromic surveillance GI illness data as an early warning indicator of increasing NV outbreak activity in Virginia. This study identified that GI syndrome visits crossed a calculated threshold value on average 1.25 weeks before the initiation of high NV outbreak activity. Although NV outbreaks occur year round, this study attempted to identify an indicator to trigger meaningful risk communication to the community immediately prior to high NV outbreak activity with the goal of reducing the magnitude of NV outbreaks. This early warning tool for NV outbreak activity will be implemented in the following year to validate its effectiveness and timeliness in mitigating NV outbreaks in Virginia.



Percent of Emergency Department and Urgent Care Center Visits with GI Syndrome and Reported Norovirus Outbreaks, Virginia, May 2008-May 2012.

Keywords

Syndromic surveillance; ESSENCE; Norovirus; GI illness

References

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*Erin E. Austin
E-mail: erin.austin@vdh.virginia.gov