

Analysis of syndrome definitions for gastrointestinal illness with ICD9 codes for gastroenteritis during the 2006-07 norovirus season in Boston

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OBJECTIVE

We report on a retrospective analysis of gastrointestinal syndrome definitions based on chief complaints and ICD9 diagnosis for gastroenteritis during the 2006-07 season of increased norovirus activity.

BACKGROUND

The Boston Public Health Commission's (BPHC) syndromic surveillance system receives daily, de-identified patient-visit data from 10 hospital emergency departments (EDs) in the city of Boston. For each patient-visit, data collected includes date of visit, chief complaint, gender, zipcode of residence, age, and race. A primary ICD9 discharge diagnosis is collected when it becomes available. Data are received every 24 hours, and syndromes are analyzed for statistical aberrations in the number of visits using the Early Aberration Reporting System (EARSv3).

During the winter of 2006-07 BPHC investigated 18 confirmed or suspected norovirus outbreaks among Boston institutions and identified 1,327 confirmed or suspected cases. Two new variants of norovirus were identified through confirmatory laboratory testing.

METHODS

Between November 1, 2006 and February 28, 2007, BPHC actively monitored three non-exclusive syndrome definitions for gastrointestinal illness. GI1 captured visits for abdominal pain, fever, nausea, vomiting, diarrhea, anorexia, and dehydration. GI3 did the same, but excluded visits that contained gynecological or pregnancy related terms. GI4 captured visits for nausea, vomiting, or diarrhea.

Retrospective analysis of the frequency of visits within each gastrointestinal syndrome group and the frequency of primary ICD9 codes for gastroenteritis (558.9 or 008.8) was performed. The sensitivity and positive predictive value was calculated based on the proportion of ICD9 codes for gastroenteritis that were captured by each syndrome group. Relative changes in total visits, by month, under each syndrome definition were calculated and compared to the same trend in ICD9 diagnostic codes for gastroenteritis.

RESULTS

From November 1, 2006 to February 28, 2007, chief complaint data from 152,417 patient visits to Boston EDs were recorded by the BPHC syndromic surveillance system. Of those, 27,532 (18.1%) were classi-

fied under the GI1 definition, 19,202 (12.6%) were captured by GI3, and 9,932 (6.5%) were captured under GI4.

Primary ICD9 codes were available for 108,888 of the 152,417 patient visits during this time period (71.4%), of which 1,706 (1.6%) were for gastroenteritis (558.9 or 008.8). Of these, 1,515 (88.8% sensitivity) were captured by GI1, 1,443 (84.6%) by GI3, and 1,248 (73.2%) by GI4. GI4 had the highest positive predictive value (12.6%). The number of visits for gastrointestinal illness and the number of ICD9s for gastroenteritis varied over the time period. Relative and absolute change is shown below, by month, for each syndrome definition.

	GI1	GI3	GI4	All Visits	
Number of Visits	27,532	19,202	9,932	152,417	
(% of All Visits)	18.1%	12.6%	6.5%		~
Visits w/ ICD9 for Gastroenteritis (558.9 or 8.8)	1,515	1,443	1,248	1,706	
Positive Predictive Value	5.5%	7.5%	12.6%		~
Sensitivity	88.8%	84.6%	73.2%		~

Number of GI syndrome visits by month (relative change from previous month)					
	GI1	GI3	GI4	All Visits	GI ICD9
Nov	5,513	3,742	1,604	36,142	193
Dec	6,800 (+23.3%)	4,562 (+21.9%)	2,248 (+40.1%)	38,646 (+6.9%)	400 (+107.3%)
Jan	7,985 (+17.4%)	5,739 (+25.8%)	3,065 (+36.3%)	40,680 (+5.3%)	671 (+67.8%)
Feb	7,234 (-9.4%)	5,159 (-10.1%)	3,015 (-1.6%)	36,949 (-9.2%)	434 (-35.0%)

Figure 1 – Summary statistics for retrospective analysis of GI syndromes and ICD9 codes for gastroenteritis.

CONCLUSIONS

All three syndrome definitions had a fairly high degree of sensitivity for cases of gastroenteritis as confirmed by ICD9 codes, however the most specific definition (GI4) had a higher positive predictive value and the largest relative change during the months with the highest numbers of gastroenteritis visits. The large increase in visits with more acute symptoms, such as diarrhea and vomiting, allowed for earlier detection via syndromic surveillance using this targeted syndrome definition, with a relatively small decrease in the sensitivity for true cases.