

# Performance of Sub-Syndrome Chief Complaint Classifiers for the GI Syndrome

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**Objectives:** Using chart review as the criterion standard to estimate the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of New York State hospital emergency department chief complaint (CC) classifiers for patients < 60 months of age and ≥ 60 months of age for the gastrointestinal (GI) syndrome and the following GI sub-syndromes: “abdominal pain”, “nausea-vomiting” and “diarrhea”.

**Background:** The Centers for Disease Control and Prevention (CDC) BioSense project has developed CC and ICD9 sub-syndrome classifiers for the major syndromes for early event detection and situational awareness. This has the potential to expand the usefulness of syndromic surveillance, but little data exists evaluating this approach. The overall performance of classifiers can differ significantly among syndromes, and presumably among sub-syndromes as well. Also, we had previously found that the seasonal pattern of diarrhea was different for patients < 60 months of age (younger) and for patients ≥ 60 months of age (older).

**Methods:** We performed a retrospective study of emergency department (ED) visits at four New York State hospitals from May 1, 2005 to April 30, 2007. These hospitals have annual ED visits ranging from 24,000 to 33,000 and have electronic medical records. We restricted our study to the three GI sub-syndromes with the highest prevalence: abdominal pain, nausea/vomiting and diarrhea. For younger and older patients separately, we selected ED records from each of the 24 months for the day with the highest percentage of records with the ICD9 code for diarrhea (“peak days”). From the peak days a sample of records were randomly selected for chart review: 500 for the younger and 2500 for the older age groups. Three physicians then assigned the visits nonexclusively to the sub-syndromes by electronic medical chart review (CR) if there was an acute (< 2 weeks) episode that was possibly infectious in origin. We did not count the visit within a GI sub-syndrome if another specific etiology was present; e.g. bowel obstruction, appendicitis, migraine, acute MI, etc. Areas of ambiguity were

resolved by consensus. The sensitivities, specificities, PPV and NPV of the sub-syndrome chief complaint classifiers using the chart review as the criterion standard were calculated.

**Results:** There were 238,547 ED visits in the study population. For the older age group, there were 6,825 total visits on the 24 peak days. From these visits, 2,500 visits were randomly selected resulting in 2,040 charts available for review. For the younger group there were 928 total visits of which 500 were randomly selected and 408 were available for review. Table 1 summarizes the prevalence, sensitivity, specificity, PPV, and NPV for the GI syndrome and sub-syndromes.

**Conclusion:** The CC classifiers for the three GI sub-syndromes had lower sensitivities but higher specificities than the GI syndrome. The sensitivities of the sub-syndromes varied greatly between the two age groups. In this enriched dataset, diarrhea sub-syndrome had highest PPVs for both age groups. Further evaluation is being conducted to review the reasons for false negatives and false positives and to examine the overlap between visits identified by the different sub-syndromes.

**Table 1– GI Syndrome and Three GI Sub-syndromes**

< 60 months	Prev by CR	Sens	Spec	PPV	NPV
GI	21.3%	0.75	0.94	0.76	0.93
Abdominal Pain	2.9%	0.17	0.99	0.33	0.98
Nausea & Vomiting	16.7%	0.72	0.96	0.77	0.94
Diarrhea	16.4%	0.48	0.99	0.86	0.91
≥ 60 months	Prev by CR	Sens	Spec	PPV	NPV
GI	9.0%	0.74	0.94	0.54	0.97
Abdominal Pain	7.4%	0.62	0.95	0.50	0.97
Nausea & Vomiting	5.9%	0.46	0.97	0.53	0.97
Diarrhea	4.3%	0.32	0.99	0.80	0.97