ICD9 as a Surrogate for Chart Review in the Validation of a Chief Complaint Syndromic Surveillance System

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Introduction

The existing New York State Department of Health emergency department syndromic surveillance system has used patient's chief complaint (CC) for assigning to six syndrome categories (Respiratory, Fever, Gastrointestinal, Neurological, Rash, Asthma). The sensitivity and specificity of the CC computer algorithms that assign CC to syndrome categories are determined by using chart review as the criterion standard. These analyses are used to refine the algorithm and to evaluate the effect of changes in the syndrome definitions. However, the chart review (CR) method is labor intensive and expensive. Using an automated ICD9 code-based assignment as a surrogate for chart review could offer a significant cost reduction in this process and allow us to survey a much larger sample of visits.

Objectives

Our objective was to examine the ability of an ICD9 discharge diagnosis assignment algorithm to substitute for chart review as the criterion standard to evaluate chief complaint algorithms for six syndromes.

Methods

A random sample of 1500 emergency department visits to two hospitals in New York State during 2004 was selected. Data available included patient chief complaint, age, sex, physician diagnosis, ICD9 diagnosis, and physician's electronic note. Based on New York State syndrome definitions, two physicians by consensus constructed an automated ICD9 assignment method for each of the six syndromes. Each patient visit was assigned to syndrome categories based on CC, ICD9, and CR. For each syndrome, sensitivities and specificities of the ICD9 versus CR as the criterion standard and similarly CC versus CR and CC versus ICD9 were calculated. The ability of ICD9 to substitute for CR was measured in terms of the percent of CC identified by CR as true positives (TP), true negatives (TN), false positives (FP) and false negatives (FN) that were identically identified when ICD9 was substituted as the criterion standard.

Results

Table 1 summarizes the sensitivities and specificities of the ICD9 versus CR as the criterion standard and similarly CC versus CR and CC versus ICD9. The specificities of all three methods varied by $\leq$ 2%. The sensitivities varied greatly by syndrome.

Table 2 summarizes our measures of the ability of ICD9 to substitute for CR. Using CC versus CR as the correct assignment, the percent correctly identified by ICD9 ranged from 35% to 86% for TP, 98% to 99% for TN, 44% to 100% for FP and 22% to 65% for FN.

Conclusion

ICD9 codes had the ability to correctly identify a significant portion of false negatives and false positives, but the percent of TP varied by syndrome indicating that the ICD9 method was not a perfect surrogate for CR for evaluating our CC classifiers. It may have a limited role as a method to screen large number of patients to identify possible false positives and negatives for further study to improve CC algorithms.

Table 1	**Sensitivity**			**Specificity**		
Syndrome	ICD vs CR	CC vs CR	CC vs ICD	ICD vs CR	CC vs CR	CC vs ICD
Resp	66%	71%	72%	96%	95%	94%
GI	56%	64%	69%	98%	97%	98%
Fever	28%	47%	52%	99%	99%	97%
Asthma	70%	35%	38%	100%	100%	99%
Neuro	55%	51%	54%	97%	97%	95%
Rash	61%	18%	20%	99%	99%	97%

Table 2	**Percent correctly identified by ICD9**			
Syndrome	TP	TN	FP	FN
Resp	73%	98%	64%	50%
GI	64%	99%	70%	42%
Fever	35%	99%	71%	22%
Asthma	86%	99%	100%	63%
Neuro	67%	98%	44%	43%
Rash	45%	99%	67%	65%

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