Sensitivity and Specificity of ICD-9 Based Syndromic Surveillance System in a Rural Emergency Department, Michigan 2004

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OBJECTIVE

This paper describes the analysis of sensitivity and specificity of an ICD-9 based syndromic surveillance system in a rural emergency department located in Northern Lower Michigan.

BACKGROUND

The use of syndromic surveillance systems to assist with the timely detection of unusual health events first occurred prior to the events of September 11, 2001 [1]. In the State of Michigan a pilot project with emergency departments began collecting syndromic data in 2004. Little research has been done in rural settings which have unique characteristics such as having one medical facility for a large geographic region. In addition to being rural, the community in which the following study was done is a resort community where the population differs between the summer and winter months in number and composition. Another unique factor in this study is that there is little published literature utilizing triage and discharge syndromic groups as a means for determining system sensitivity and specificity.

METHODS

Four years of historical emergency department data was obtained from a hospital in Northern Lower Michigan. The data set included 143,975 entries with fields for patient age, patient gender, triage ICD-9 code, discharge ICD-9 code, admit and discharge day of week and date. Syndromic groups were based on the ICD-9 codes presented by the multi-agency consensus statement [2]. Sensitivity and specificity of each syndromic group was analyzed using the discharge ICD-9 based syndromic group as the reference and comparing the triage ICD-9 syndromic group it. Analysis was done in subgroups including sex, age group, day of week of visit, month of visit, and residency status to determine significant differences in system sensitivity and specificity between values in these groups and the overall sensitivity and specificity. Logistic regression modeling was used to determine the best predictors of each syndromic group's sensitivity and specificity using SAS (Cary, NC). Dummy variables and "where" statements to restrict the cases to those with the triage syndromic group of interest were used for each syndromic group. Significant predictors were those with a p-value of less than 0.05 in simple logistic regression. The overall models built with significant predictors from simple logistic regression were assessed using likihood ratio Chi-square tests. In addition, graphs of the average weekly case count and 95% confidence interval were generated for each syndromic group.

RESULTS

The sensitivity and specificity of the system varied greatly both between and within syndromic groups. Sensitivity ranged from 34.40% in the lymph/lesion group to 89.09% in the neurologic group. Specificity ranged from 85.89% in the other group to 99.81% in the lymph/lesion group. The overall high specificity indicates that the syndromic group definitions can be modified by decreasing specificity to increase sensitivity. The analysis of sub-groups within each syndromic group provided insight to factors affecting sensitivity and specificity of a given syndromic group. The significant differences between overall syndromic group sensitivities and specificities and category-specific sensitivities and specificities in each syndromic group demonstrates the importance of assessing the composition line lists for patient characteristics prior to initiating investigations.

CONCLUSIONS

This study provides a starting point for further investigation into the appropriate composition of syndromic groups in a rural setting. The use of triage and discharge ICD-9 codes to determine sensitivity and specificity may be less ideal than chart review, however, the data is readily available in most hospital systems and can be downloaded in real-time. By providing clinical staff with sensitivity and specificity information in near real-time, they can make weighted investigation and follow-up decisions. Thus, resources are used more appropriately. sensitivity. Detailed analysis of patients whose discharge ICD-9 codes place them in a different syndromic group than their triage ICD-9 codes will inform syndromic group definition changes.

REFERENCES

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