A Simple Method of Using Linked Health Data in Syndromic Surveillance

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OBJECTIVE

This paper describes a simple technique for utilizing linked health information in syndromic surveillance. Using knowledge of which patient encounters resulted in laboratory test requests and prescriptions may improve sensitivity and specificity of detection algorithms.

BACKGROUND

Syndromic surveillance primarily relies upon existing sources of pre-diagnostic data and analyzes these sources separately. For example, a syndromic surveillance system that receives three data streams (emergency department chief complaints, clinic visit International Classification of Disease Ninth Revision (ICD9) code data, and over-the-counter drug sales) would analyze them separately for anomalies without knowledge of whether the same patient's data were from different data sources. With the advent of electronic medical records (EMRs), it is now possible to know, for example, that specific patients who were assigned certain ICD9 codes during an office visit also received specific laboratory requests and prescription orders. Knowledge of these linkages may add value to syndromic surveillance detection and situational awareness capabilities.

METHODS

One year of anonymized but linked health information were analyzed. The data contained link identifiers that showed which visits resulted in which lab requests and prescription orders. The technique for incorporating this information was simply to count the number of linked lab requests and prescriptions filled for each visit. This tally ranged from zero to greater than 9 and was called a severity linkage score. The ability to query data for scores greater than or equal to a given number (0+ up to 9+) was added as a feature to a population-based syndromic surveillance system. The premise is that the more ill the patient, the more lab requests and prescriptions they might receive.

RESULTS

The plots in Fig. 1 show respiratory syndrome data displayed as a time series to illustrate increases that could be associated with seasonal respiratory illness outbreaks. The top plot shows all the data, regardless of severity linkage score. The middle and bottom plots show what happens to detection when the query limits the data to those visits with severity linkage scores greater than or equal to 1 and 2, respectively.

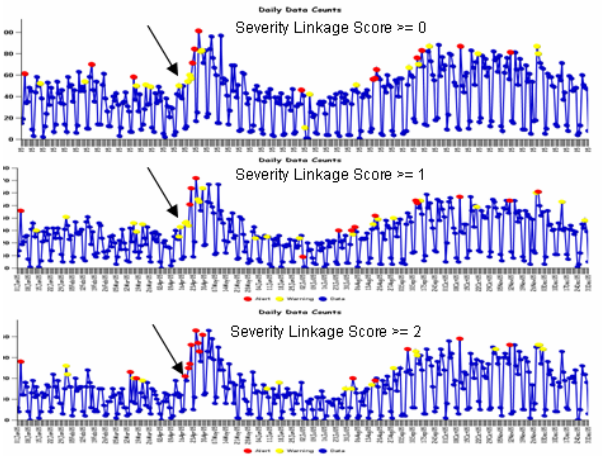

Figure 1 – Daily plot of Respiratory Syndrome Counts for 5-17 yr olds with different severity linkage scores.

CONCLUSIONS

Fig. 1 shows that, as data are restricted to higher severity linkage scores, certain seasonal disease outbreaks become more apparent, receive higher alert levels, and seem to be detected earlier. For example, not only is the April event detected earlier as a red alert, an estimated signal-to-noise ratio [1] for this event increased by about 26% as the severity linkage score filtering increased from scores of 0+ to 1+ and again from 1+ to 2+, according to the Fig. 1 plots. Of course, as the severity linkage score is increased, the number of daily counts decreases so that a point of diminishing returns is eventually reached.

While this technique is very simple and easily applied, there are a variety of ways in which it might be improved. Different types of lab tests and prescription drugs could receive different weights in the tally. Additionally, there may be certain lab tests and prescription drugs that should be excluded from the score because they reflect more chronic conditions. We also have plans to include radiology requests in the score. However, overall it appears that this simple technique provides additional benefit to syndromic surveillance.

REFERENCES

[1] Magruder SF, Marsden-Haug N, Hakre S, Coberly JS, McClean CG, Johnson JM, Anderson A, Pavlin J. Comparisons of timeliness and signal strength for multiple syndromic surveillance data types in San Diego County. MMWR 2005;54(Suppl);193

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