ABSTRACT

An automated influenza-like-illness reporting system using freetext emergency department reports

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Objective

This paper describes an automated Influenza-Like-Illness (ILI) reporting system based on natural language processing of transcribed ED notes and its impact on public health practice at the Allegheny County Health Department (ACHD).

Introduction

Current methods for influenza surveillance include laboratory confirmed case reporting, sentinel physician reporting of ILI and chief-complaint monitoring from emergency departments (EDs).

The current methods for monitoring influenza have drawbacks. Testing for the presence of the influenza virus is costly and delayed. Specific, sentinel physician reporting is subject to incomplete, delayed reporting. Chief complaint (CC) based surveillance is limited in that a patient's chief complaint will not contain all signs and symptoms of a patient.

A possible solution to the cost, delays, incompleteness and low specificity (for CC) in current methods of influenza surveillance is automated surveillance of ILI using clinician-provided free-text ED reports.

Methods

Our ILI reporting system has five parts: an HL7 message parser, the MedLEE natural language processing algorithm, a database, rule-based logic, chart engine and email server. The HL7 message parser extracts ED reports from HL7 messages. Then, MedLEE[1] finds medical terms contained in each report, including significant negative findings. We store the NLP results in a database using an entity attribute value schema. The rule-based case definitions represent CDC's ILI case definition, (*Fever* or *Chills*) and (*Cough* or *Sore throat*),[2] and the symptoms found by the NLP for each patient are tested against this logic. The system plots a 6-month time series graph of the percentage of total ED visits per day with ILI detected by the rule-based logic. The graph also includes a 5-day moving average (centered on the 3rd day) of the daily ILI time series to follow existing practices at ACHD. We employ Jfreechart to create the chart with the two time series. Every day the system sends the report to ACHD using a mail server.

We performed a preliminary evaluation of the system comparing ILI rule-based logic output with manual review of the transcribed ED reports by a physician board, certified in infectious diseases.

Results

We deployed the ILI reporting system in early May 2009 in Allegheny County. It receives transcribed ED reports by HL7 messages from the seven EDs of the UPMC Health System. The average number of daily ED visits with ED reports between July and Dec. 2009 was 569. Figure 1 shows the ILI chart for 31 December 2009 report that comprises daily ILI percentage and its 5-day moving average between 15 June 2009 and 30 December 2009.

Our evaluation using 140 randomly selected reports (78 positives) found a sensitivity of 94.9% (95%CI: 87.54–97.99%), a specificity of 100% (95% CI: 94.17–100%), and a positive predictive value of 100% (95% CI: 94.17–100%).

These charts had three impacts on practice at ACHD: (1) ACHD had daily updates instead of weekly reports (from sentinel physicians). (2) ACHD provided the charts to local media on a regular basis.[3] (3) ACHD reduced staff time as they no longer had to manually compile ILI reports from sentinel ILI reports (2 days of work for each weekly report).
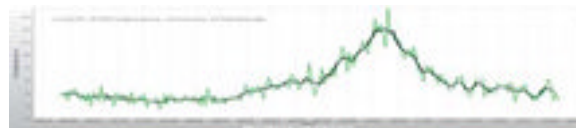

Figure 1 Daily reporting chart showing daily percentage of ED visits with ILI (green) and its 5-day moving average (black) between 15 June 2009 and 30 December 2009.

Conclusions

We demonstrate utility and method of using free text ED reports for ILI reporting and flu surveillance.

Acknowledgements

References

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3 Two more people die from H1N1 in Pittsburgh area [online] 2009 cited. Available from: http://kdka.com/health/H1N1.flu.deaths.2.1321133.html.