Surveillance Investigation Tool Development Targeted For Results

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OBJECTIVE

This paper details the development of electronic surveillance tools by Communicable Disease Surveillance, which have increased detection and investigation capabilities.

BACKGROUND

The Automated Hospital Emergency Department Data (AHEDD) System is designed to detect early indicators of bioterrorism events and naturally occurring public health threats. Four investigatory tools have been developed with drill-down detail reporting:

1. Syndromic Alerting,
2. Chief Complaint Data Mining
3. ICD9 Code Disease, and
4. Influenza-Like-Illness (ILI) Tracking.

All analysis processing runs on the server in seconds using ORACLE PL/SQL stored procedures and arrays.

METHODS

Seven NH hospitals transmit real-time Emergency Department data securely using HL7 format via Virtual Private Network (VPN) to the NH Division of Public Health Services data repository. Vendor created syndrome alerts were developed with the RODS syndrome classifier CoCo [1], standard statistics, and CUSUM and Zhang [2], methodologies) to detect mid to large disease clusters. Alerts occur when counts exceed 3 standard deviations over baselines for the same month previous year/s. Chief complaint data text mining detects over 140 infectious diseases using queries with exclusions, array groupings, and data values within these groupings. Likewise, non-reportable Influenza-Like-Illness (ILI) encounters are detected similarly and charted as a percent of total encounters by MMWR week.
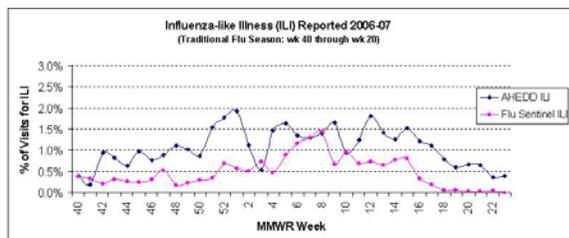

Figure 1 – The chart above compares ILI non-reportable query encounters against Flu Sentinel Reports as a percentage of total hospital visits for the 2006-7 Influenza season.

Lastly, real-time, reportable disease reporting queries, targeting associated ICD9 diagnosis codes, allow staff to begin investigations proactively.

RESULTS

Syndromic alerts have detected large clusters of activity such as a flu clinics in hospitals, town mass casualty exercises; and mid-size clusters of Respiratory, GI, and Constitutional (Fever/Flu) illness. Data text mining queries have detected encounters of Varicella, Meningitis, and Hepatitis missed in broad syndromic alerting. Automated ICD9 disease reporting detected Lyme disease, Varicella, Hepatitis, and Varicella missed in both broad syndrome alerts and data text-mining queries. All ILI encounter detections met the ILI case definition, and the majority of these were validated by one or more ILI diagnosis codes [3]. Additionally, ILI AHEDD and CDC Sentinel Reporting graphed similarly.

CONCLUSIONS

Disease Surveillance has noted greater disease detection using these prompt, flexible surveillance investigation tools. Chief complaint data mining has detected infectious disease missed by syndrome alerts; and both chief complaint data mining and automated ICD9 disease-reporting tools detected encounters not reported by other means, which has resulted in proactive investigation collaborations with hospital Infection Control Practitioners. Additional ILI clinical values were added to the ILI query based on assessment findings.

REFERENCES

[1] Syndrome Classification uses *RODS CoCo, version 3.0 source code* to classify Emergency Department encounters by chief complaint. Real-time Outbreak and Disease Surveillance (RODS), RODS Laboratory, University of Pittsburgh, Pittsburgh, PA, **http://openrods.sourceforge.net/**.

[2] X.Zhang, R. Fiedler and M. Popovich, A Biointelligence System for Identifying Potential Disease Outbreaks,IEEE Engineering in Medicine and Biology, Jan 2004.

[3] Marsden-Haug, N., Foster, V.B, Gould, P.L., Elbert, E., Wang, H., and Pavlin, J.A. (Feb 2007), *Code-based Syndromic Surveillance for Influenza like Illness by International Classification of Diseases, Ninth Revision*, Emerging Infectious Diseases, www.cdc.gov/eid, Vol. 13, No. 2, pages 1806-1811.

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