Combining Laboratory Test Orders and Outpatient Visits to Monitor Respiratory Illness

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OBJECTIVE

To evaluate whether joint monitoring of laboratory test orders and outpatient visits improves the sensitivity and timeliness of alerting during seasonal increases in respiratory illness.

BACKGROUND

The ESSENCE surveillance system in use by the Department of Defense (DoD) relies primarily on outpatient clinical impression diagnosis. DoD outpatient military treatment facilities perform nearly 500,000 microbiology laboratory tests annually, and test order data are available through a centralized electronic data repository. If laboratory test orders provide a more specific indicator of suspected respiratory illness than clinical impression diagnosis, they may improve monitoring of the respiratory syndrome. Prior research identified microbiology laboratory tests that are associated with respiratory outpatient visits over time, and are preferentially ordered when a diagnosis of respiratory illness is present [1]. Here we report a preliminary evaluation of joint surveillance of outpatient and laboratory test order data for respiratory illness.

METHODS

Data on outpatient microbiology laboratory tests and outpatient visits to military treatment facilities in ten regions were obtained for November 2, 2002 - October 31, 2004. ICD-9 codes were used to identify outpatient visits associated with respiratory illness using ESSENCE syndrome definitions documented in <http://www.geis.fhp.osd.mil/GEIS/SurveillanceActivities/ESSENCE/ESSENCE.asp>. Microbiology laboratory tests assigned to the respiratory syndrome include throat, viral and respiratory cultures, along with specific tests for RSV, influenza, group A strep and *Bordetella*. The ESSENCE II algorithm was used to obtain *p*-values corresponding to daily counts of outpatient visits and laboratory test orders. Combined surveillance was performed by averaging the *p*-values from the two sources on the same day. The alerting threshold was set empirically to yield 18 alerts over the two-year period (one per six weeks) by selecting the 18 smallest *p*-values. Timing of alerts in the late summer/early fall of 2003 and 2004 was compared using the Wilcoxon signed rank test.

RESULTS

Seasonal increases in respiratory illness were evident in all twenty data streams (ten regions and two seasons), typically starting between late August and early October. Most increases were detected in both laboratory and outpatient visit data, but the timeliness of the alerts varied. Laboratory test orders alerted before the end of the year in 19 of 20 data streams, and outpatient visits alerted in 17 of 20 data streams. When *p*-values from the two algorithms were combined, 18 of 20 data streams alerted. Laboratory data alerted before outpatient visit data for 12 of 20 data streams, and on the same day for 6 of 20 data streams, with the median date of first alert occurring sixteen days earlier ($p = 0.07$). Alerts typically occurred earliest when the two data sources were monitored jointly. The combined data alerted before the laboratory data for 10 of 20 data streams, with the median date of first alert occurring one day earlier ($p = 0.79$). The combined data alerted before the outpatient visit data for 13 of 20 data streams, with the median date of first alert occurring seven days earlier ($p = 0.01$).

CONCLUSIONS

Preliminary evaluation of outpatient microbiology laboratory test order data indicates that this data source provides an earlier indication of seasonal increases in respiratory illness than is available using outpatient visits alone. Next steps include further research to explore effective ways of combining the two data sources and to evaluate additional disease syndromes, as well as implementation of real-time monitoring of laboratory test order data.

REFERENCES

[1] Olsen CH, Malone JD, Hakre S, Pavlin JA. Effective use of laboratory data for monitoring population health. *Advances in Disease Surveillance* 2007; 2:211.

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