

Effective Use of Laboratory Data for Monitoring Population Health

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OBJECTIVE

To evaluate the association between military microbiology laboratory test orders and infectious disease patterns.

BACKGROUND

Effective public health response to emerging infectious diseases, natural disasters, and bioterrorism requires access to real-time, accurate information on disease patterns and healthcare utilization. The ESSENCE surveillance system in use by the Department of Defense (DoD) relies primarily on outpatient clinical impression diagnosis, which accurately characterize broad disease syndromes but may not be sufficient for monitoring specific diseases. DoD outpatient military treatment facilities (MTFs) perform nearly 500,000 microbiology laboratory tests annually. Initiated electronically, the ordered test is recorded immediately; most provide specific results in 24 to 72 hours and may prove useful for monitoring population health. Although a syndrome classification has been developed for laboratory tests [1], the classification cannot be applied directly to the DoD data and no previous study has validated the use of automated laboratory test orders for syndromic surveillance.

METHODS

Data on outpatient microbiology laboratory tests and outpatient visits to 166 MTFs were obtained for November 2, 2002 - October 31, 2004. Multiple spellings of the same test name were consolidated. Test results could not be monitored due to lack of standardized reporting, so only test orders were evaluated. Outpatient visits were assigned to disease syndromes based on ICD-9 diagnostic codes. We compared laboratory test orders to outpatient visits by (1) identifying tests most likely to be ordered during outpatient visits within each disease syndrome, (2) examining correlations over time between frequencies of test orders and outpatient visits for each disease syndrome, and (3) evaluating peaks in test orders during documented disease outbreaks.

RESULTS

A comparison of laboratory test orders and ICD-9 diagnostic codes recorded for the same outpatient visits confirms that in general, laboratory tests assigned to a particular syndrome in the BioSense mapping [1], modified for military data, are ordered more often during visits with a diagnosis for that syndrome. Gastrointestinal test orders, particularly stool

cultures and fecal WBC, correlate over time with gastrointestinal diagnoses, and increased substantially during two norovirus outbreaks in San Diego. Throat culture orders are strongly correlated with outpatient visits for respiratory illness, and may provide a stronger early signal for respiratory outbreaks than current surveillance data. To illustrate these relationships, we present data for two regions, the National Capital Area and San Diego, during the 2003-2004 influenza season and during a norovirus outbreak in San Diego (table). Most other tests are ordered so infrequently that it is difficult to evaluate their utility for surveillance.

	Average daily count (excluding outbreaks)	Peak count during outbreak	Correlation with outpatient visits
National Capital (Influenza)			
Respiratory visits	473	931	1
Throat cultures	88	147	0.786
Blood cultures	18	33	0.701
Respiratory cultures	2	5	0.533
Viral cultures	<1	4	0.750
San Diego Area (Influenza)			
Respiratory visits	453	1046	1
Throat cultures	64	113	0.349
Blood cultures	26	42	0.354
Respiratory cultures	1	4	0.450
San Diego Area (Norovirus)			
Gastrointestinal visits	64	178	1
Fecal white blood cells	2	4	0.421
Fecal occult blood	18	27	0.187
Stool cultures	3	6	0.324

CONCLUSIONS

DoD microbiology laboratory data may be used to monitor public health; in future data systems, test nomenclature and results should be standardized for more effective monitoring. Practice patterns and laboratory test/outpatient visit associations vary by region, so monitoring may be most effective at the regional level. More research is needed to evaluate whether laboratory tests may be used to monitor less common illnesses, including rash, neurological, and fever syndromes, and whether adding laboratory test data to ESSENCE would improve early detection of disease outbreaks.

REFERENCES

- [1] Ma H, Rolka H, Mandl K, Buckeridge D, Fleischauer A, Pavlin J. Implementation of laboratory order data in BioSense Early Event Detection and Situation Awareness System. *MMWR Morb Mortal Wkly Rep.* 2005 Aug 26;54 Suppl:27-30.

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