

Hierarchical filtering of ESSENCE for routine, distributed disease monitoring by the Veterans Health Administration

Howard Burkom^{1*}, Yevgeniy Elbert¹, Vivian Hung¹, Aaron Wendelboe³, Chris Lee¹, Richard Wojcik¹, Patricia Schirmer², Cynthia Lucero² and Mark Holodniy²

¹Johns Hopkins Applied Physics Laboratory, Laurel, MD, USA; ²Veterans Affairs Palo Alto Health Care System, Palo Alto, CA, USA; ³University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA

Objective

The objective was to adapt and tailor the alerting methodology employed in the Electronic Surveillance System for Early Notification of Community-Based Epidemics (ESSENCE) used by Veterans Affairs (VA) for routine, efficient health surveillance by a small, VA headquarter medical epidemiology staff in addition to a nationwide group of infection preventionists (IPs) monitoring single facilities or facility groups.

Introduction

The VA has employed ESSENCE for health monitoring since 2006 (1). Epidemiologists at the Office of Public Health (OPH) monitor the VA population at the national level. The system is also intended for facility-level monitoring to cover 152 medical centers, nearly 800 community-based outpatient clinics (CBOC), and other facilities serving all 50 states, the District of Columbia and U.S. territories. For the entire set of facilities and current syndrome groupings, investigation of the full set of algorithmic alerts is impractical for the group of monitors using ESSENCE. Signals of interest may be masked by the nationwide alert burden. Customized querying features have been added to ESSENCE, but standardization and IP training are required to assure appropriate use.

Methods

We derived and refined default alerting filters relevant to the monitor's purview, beginning with three jurisdictional levels: (1) facility; (2) facility group or station, including all clinics and divisions associated with a parent VA medical center; and (3) superuser, referring to routine system-wide monitors. The filters were based on the number of patients, statistical significance of alerts and a composite severity measure. This measure was derived from case-based criteria developed for the Department of Defense ESSENCE (2) and adapted by OPH epidemiologists for the VA population. These criteria are based on separate monitoring of evaluation/management codes for complex cases,

Table 1. VA ESSENCE mean alerting summary

Filter	Alerts per day	Alerts per weekday	Alerts per weekend day
Superuser (no filter)	410.44	538.71	89.76
Superuser (filtered)	25.12	32.96	5.53
VA station mean (no filter)	4.37	5.72	1.01
VA station mean (filtered)	1.08	1.42	0.24
VA facility mean (no filter)	2.17	2.69	0.87
VA facility mean (filtered)	0.20	0.25	0.08

Dataset including 843 facilities, July 1, 2010–July 27, 2011.

OPH-selected procedure codes, 'bounce-backs' to an emergency setting, patient age distributions anomalous for a VA facility and extreme spikes; case disposition was not yet available. We tested candidate filters by tabulating alert rates and sensitivity to known outbreaks using 13 months of all-VA historical outpatient data. For the superuser, the filter required at least one severity factor among records composing an alert, at least 3 cases (5 for the common syndromes) and only p -values < 0.01 . These restrictions were reduced in localized user filters.

Results

The full set of unfiltered ESSENCE alerts at levels of high and moderate significance, applied for 8 syndrome groupings to all medical centers, CBOCs and other facilities sending outpatient and emergency department data, was on average 410 per day (539 per week day). Table 1 illustrates the sharp drop in alerting using filters developed to present only sets of records selected for investigation at each level. Additional results will show the sensitivity of the resultant hierarchical system to documented outbreaks at the various levels.

Conclusions

Hierarchical filtering can furnish practical, canonical alert criteria applied to algorithm alerts. As circumstances change, users may reconfigure for increased sensitivity or altered coverage with ESSENCE customization tools. The planned addition of new data elements (laboratory/micro, pharmacy and radiology) will further refine alerting. These refinements can increase detection/response capability by focusing attention on signals of interest with a reasonable alert burden.

Keywords

Distributed surveillance; syndromic; outbreak detection; severity

References

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*Howard Burkom

E-mail: howard.burkom@jhuapl.edu