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ABSTRACT

Surveillance for acute respiratory infections: should we include all outpatient visits or focus on urgent care areas?

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Introduction

A comprehensive electronic medical record (EMR) represents a rich source of information that can be harnessed for epidemic surveillance. At this time, however, we do not know how EMR-based data elements should be combined to improve the performance of surveillance systems. In a manual EMR review of over 15 000 outpatient encounters, we observed that two-thirds of the cases with an acute respiratory infection (ARI) were seen in the emergency room or other urgent care areas, but that these areas received only 15% of total outpatient visits.[1] Because of this seemingly favorable signal-to-noise ratio, we hypothesized that an ARI surveillance system that focused on urgent visits would outperform one that monitored all outpatient visits.

Methods

Time series of daily casecounts (background) were created by applying one of eight different ARI case detection algorithms (CDAs) to EMR entries related to 'all' or to 'urgent-only' outpatient encounters at the VA Maryland Health Care System. The CDAs were constructed using various combinations of diagnostic codes, medications, vital signs, and/or computerized free-text analyses of whole clinical notes.[1] We used an age-structured metapopulation influenza epidemic model for Baltimore to inject factitious influenza cases into these backgrounds. Injections were discounted by the known sensitivity of each CDA.[1] Injections destined to urgent-only backgrounds were further discounted by 33%, to reflect the proportion of ARI patients who present to routine rather than urgent care areas. From the time of injection, CDC's EARS-W2c statistics[2] were applied on each successive day on paired background + injection vs background-only time series. Each injection-prospective-surveillance cycle was repeated 52 times, each time with the injection shifted to a different week of the 1-year study period (2003–2004). We computed: (1) the 'detection delay', the average time from injection to the first alarm present in the background + injection dataset but absent from the background-only dataset; (2) the 'false alarm rate' (FAR), defined as the number of unique false alarms originating in the background-only dataset during the study year, divided by 365 days; (3) the 'caseload', defined as the total number of cases contained in 1 year of false alarms. To create activity monitoring operating characteristic (AMOC) curves, we empirically determined the corresponding delay-FAR or delay-caseload pairs over a wide range of alarm thresholds.

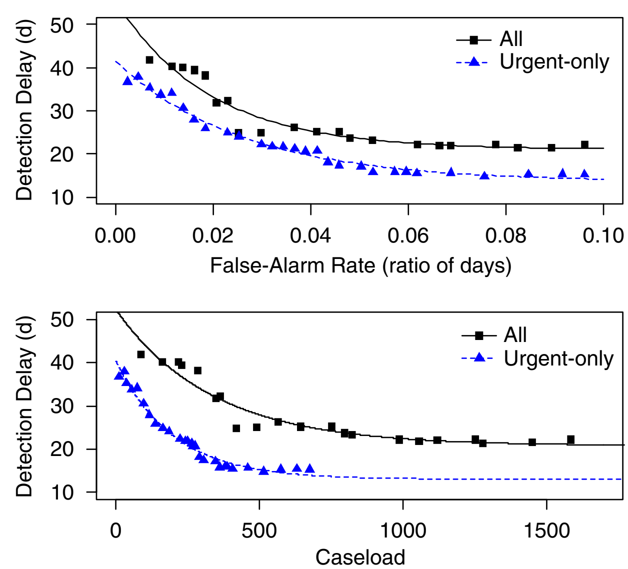

Figure 1 Performance of surveillance systems that focus either on all outpatient visits (squares) or on the subset of these visits that are urgent (triangles). Time to outbreak detection (*y*-axis) is plotted as a function of false-alarm rate (upper panel) or caseload (lower panel).

Results

Figure 1 compares AMOC curves for a representative ARI CDA (ARI-related ICD-9 codes or a new cough suppressant or two non-negated ARI symptoms from our case definition by text analysis), in otherwise identical surveillance systems that included either 'all' outpatient visits (black squares) or urgent-only visits (blue triangles). Note that detection delay (*y*-axis) is lower at any given FAR (upper panel) or caseload (lower panel). These findings were consistent across all eight CDA tested.

Conclusions

Our results suggest that ARI surveillance systems that focus on urgent/emergent care areas outperform systems that monitor all outpatient visits, even if they ignore a significant number of outpatients whose ARI coincides with routine visits.

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References

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