Clinical Surveillance Markers of Influenza-like Illness (ILI) at a Veterans Affairs (VA) Hospital

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OBJECTIVE

To use data collected by NC-VET to create an automated ILI surveillance program and compare its accuracy and efficiency to the existing program.

BACKGROUND

Emerging infections, both natural and intentional, have provided an impetus for improved disease surveillance and response. The recognition of the interdependence of health care systems and public health infrastructure provides an opportunity to expand beyond traditional disease-based surveillance to a more comprehensive, integrated approach that leverages existing electronic information. The Veterans Affairs (VA) hospital system is uniquely positioned to perform multi-institutional enhanced electronic surveillance. A wealth of electronic information and technology resources are available in all VA hospitals and their associated clinics, as each facility uses the same standardized Computer Patient Record System (CPRS). Influenza-like illness (ILI) is a common clinical syndrome of diverse etiology that presents with respiratory and systemic symptoms. The NC health department mandates the reporting of ILI from emergency departments to facilitate monitoring of seasonal ILI and serve as an important component of pandemic preparedness. Existing surveillance systems utilize an ICD-9 respiratory code screen and subsequent manual chart review which is time-consuming and insensitive. Automated medical record review using more comprehensive electronic data may improve the system's timeliness and efficiency.

METHODS

The NC-VET uses daily file transfer protocols to receive relevant clinical information from all patients seen at each of the four North Carolina VA facilities and their associated clinics. These data include ICD-9 codes, patient demographics, vital signs, chief complaints, prescriptions for antibiotics, and additional information about selected imaging tests and specialty consult requests. All visits at the Durham VAMC ED and acute care facility were initially screened for either an acute respiratory ICD-9 code or a documented fever. Pre-screened cases were then reviewed by a clinician to assign case status. A case of ILI was defined according to the standardized definition supplied by the NC health department. In the existing system, a public health epidemiologist manually reviews all patients with a respiratory ICD-9 code and a temperature >100°. A fully automated case definition was then generated using multivariable logistic regression and the accuracy was refined using receiver operator characteristic (ROC) curves. The models were internally validated using bootstrapping resampling techniques.

RESULTS

Between May 2002 and May 2007, 9172 patients presented with either fever or an acute respiratory ICD-9 code to the Durham VAMC. Of these, we reviewed 1000 patients (11%), 500 with fever and respiratory ICD-9, 250 fever only, and 250 respiratory ICD-9 only. Of these 1000 patient visits, 570 (57%) met the case definition of ILI. 690 (69%) were assigned a respiratory ICD-9 code. These patients presented primarily with fever (75%), cough (61%), sore throat (24%), and to a lesser extent, myalgias (19%) and headache (14%). Only 10 people (2%) had respiratory samples collected for influenza of which 5 were positive. The current model, which included fever>100°F and respiratory ICD-9 code, had a sensitivity of 15.7% (c statistic was 0.59). The improved electronic model added chest radiograph and medications on to the limited model. Sensitivity of this model increased to 76.3% (c statistic was 0.80). The idealized electronic model included 11 clinical and electronic variables and had a sensitivity of 94.6% (c statistic was 0.97). Bootstrapping methods validated the performance of each of the model with corresponding confidence intervals for c statistics and odds ratios.

CONCLUSIONS

Patients with ILI presented with fairly typical signs and symptoms. The current system of ILI detection at the Durham VA is not sufficiently sensitive. An automated electronic definition that includes more variables provides a higher sensitivity and may reduce workload. The model was internally validated and will be validated further in other North Carolina hospitals.

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