Evaluation of Body Temperature to Classify Influenza-Like Illness (ILI) in a Syndromic Surveillance System

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OBJECTIVE

This study aims to evaluate the sensitivity, specificity and Positive Predictive Value (PPV) of body temperature measurements $\geq$ 100.5°F in relationship to laboratory confirmation of influenza and other ILI pathogens.

BACKGROUND

The Centers for Disease Control and Prevention (CDC) defines Influenza-like Illness (ILI) for its sentinel providers as fever (temperature $\geq$ 100.5°F or 37.8°C) and a cough and/or a sore throat in the absence of a known cause other than influenza [1]. Classifying ILI with clinical data that only identifies individual aspects of the case definition may add excessive levels of unwanted noise to the system; however, the capability to analyze a patient's body temperature along with other available clinical data (ICD-9 codes) could improve diagnostic precision and more accurately classify cases of ILI in a syndromic surveillance system [2].

METHODS

Data for this study was extracted from across the Military Health System (MHS) using the Clinical Data Mart (CDM). The CDM uses a Business Objects interface to perform structured queries and analysis capabilities through a secure Web interface. Data collected between December 1, 2007 and February 29, 2008 was used to profile encounters that included at least one body temperature measurement and at least one microbiology or chemistry laboratory test for influenza (A and/or B) or one of the other ILI pathogens (RSV, adenoviruses, *S. pneumoniae, M. pneumoniae, H. influenzae, B. pertussis, C. pneumoniae, C. psittaci*).

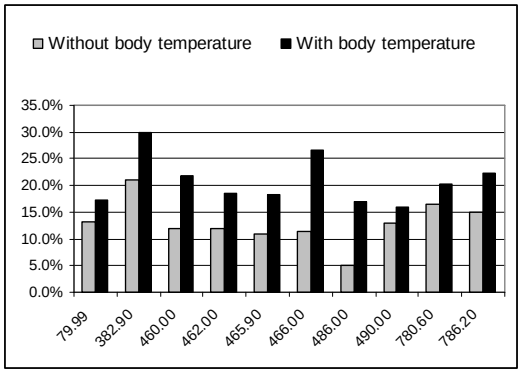
RESULTS

Those with laboratory confirmed influenza pathogens were observed to have a significantly higher body temperature ($p<0.01$) compared to those who were laboratory-negative. This trend held true for all age groups included in the sample.

Elevated body temperature was 40% efficient in correctly predicting laboratory confirmations of influenza (sensitivity), but at the same time, was 76% efficient in ruling out influenza (specificity) in the group of sampled members who were tested and subsequently determined to be negative.

For each of ten codes used to profile the ILI syndrome in ESSENCE (the Department of Defense's syndromic surveillance system), a measure of PPV was calculated with and without the use of body temperature $\geq$ 100.5° F. In other words, we calculated for each ICD-9 code the positivity rate based on laboratory results; the rate was then re-calculated for body temperature and stratified by ICD-9 code. The results are shown in Table 1 below.

Table 1. Positive Predictive Value of ICD-9 code according to use of body temperature $\geq$ 100.5ºF.



CONCLUSIONS

One chief obstacle impeding adoption of syndrome surveillance for outbreak detection and characterization purposes is the low yield of true positives compared to confirmatory laboratory testing. Our findings suggest the use of ICD-9 codes *and* body temperature $\geq$ 100.5° F may improve this yield.

REFERENCES

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