Title	Statistical algorithms for early detection of the annual influenza peak season in Hong Kong using sentinel surveillance data
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Citation	Hong Kong Medical Journal, 2013, v. 19 n. Suppl 4, p. S4-S5
Issued Date	2013
URL	http://hdl.handle.net/10722/184825
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Statistical algorithms for early detection of the annual influenza peak season in Hong Kong using sentinel surveillance data

Key Message

In Hong Kong, influenza sentinel surveillance systems have been recently established. Methods that compare current data to data from recent weeks may be appropriate to indicate the start of peak influenza activity. These methods can produce reliable and timely alerts at the start of the annual influenza peak season.

Introduction

Influenza surveillance has been conducted in many countries. In Hong Kong, a network of sentinel general practitioners provides weekly data on community influenza-like illness (ILI) rates. The second source of surveillance data is from influenza virus isolations in samples submitted to the local public health laboratory.

Given their timeliness, sentinel surveillance data facilitate early warning at the start of the annual period of peak influenza activity ('peak season'). However, given strong year-to-year variations, a simple fixed threshold is unlikely to produce useful alarms. In countries with long-standing sentinel surveillance networks, alarms are typically generated when current ILI rates surpass the 'normal' range of ILI rates in past years prior to peak seasons. In Hong Kong, sentinel surveillance has just been established, and thus historical methods are less applicable. We therefore evaluated three alternative statistical methods for generating alarms. Each method involves comparison of current rates to the 'normal' range of recently encountered rates.

Methods

This study was conducted from January to December 2006. In Hong Kong, a network of sentinel general practitioners provides influenza surveillance data on a weekly basis. At the end of each week, the sentinel practitioners report the number of consultations of patients complaining of ILI symptoms (fever plus cough or sore throat) out of the total number of consultations. Data are collated and analysed by the following Wednesday or Thursday, thus the reporting delay is approximately one week. The data are retrieved from Hong Kong island, Kowloon, New Territories East, and New Territories West, and then aggregated. Influenza virus isolated in samples obtained primarily from hospitals and sent to the Government Virus Unit of the Department of Health serves as a complementary source of surveillance data.

Three statistical algorithms (a time series method, a Shewhart control chart, and a cumulative sum method) on the aggregated sentinel surveillance data were compared. The performance of the time series on sentinel data from the separate geographical areas was then evaluated. Three algorithms were compared using the metrics of sensitivity, specificity, and timeliness, as well as a composite metric (range, 0-1) based on all three metrics, known as the volume under the time–receiver operating characteristic surface (VUTROCS).[1] The laboratory data were used to provide a 'gold standard' estimate of the start of the peak season each year.

Results

In the Hong Kong setting, the time series method was found to be optimal (best VUTROCS = 0.82 and 0.90 for general practitioner and general out-patient clinic

Hong Kong Med J 2013;19(Suppl 4):S4-5

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RFCID project number: 04050102

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data, respectively), whereas the control chart method had slightly inferior performance. In the analysis of sentinel reports from separate geographical areas, as a means of detecting peak influenza activity, data from a particular geographical area could be even more useful than those from the whole territory. Moreover, combining data streams from different areas may further improve performance.[2]

Conclusions

For influenza surveillance, methods that compare current data to data from recent weeks can generate sensitive, specific, and timely alerts at the start of peak influenza activity, and may be an alternative to comparing current data to historical data. These methods could be useful in Hong Kong, as there is not a long historical series of sentinel surveillance data to implement the historical method.

Acknowledgements

This study was supported by the Research Fund for the Control of Infectious Diseases, Food and Health Bureau, Hong Kong SAR Government (#04050102). We gratefully acknowledge the sentinel practitioners who through their own goodwill have been providing weekly data to the Hong Kong Centre for Health Protection, for the purpose of infectious disease surveillance. We thank Ms Marie Chi for secretarial support.

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