Original Article

“Syndromic Surveillance within a Hospital” for the Early Detection of a Nosocomial Outbreak of Acute Respiratory Infection


International Medical Center of Japan, Tokyo 162-8655, Japan

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SUMMARY: We have performed intra-hospital syndromic surveillance to rapidly detect nosocomial acute respiratory infection outbreaks in both inpatients and health care workers in a hospital. Syndromic surveillance allows the rapid detection of sudden outbreaks, including infections caused by unknown pathogens. This approach depends on the identification of specific “symptoms” as signs of a possible outbreak, with no need for specific diagnoses. Moreover, syndromic surveillance is quick, easy, and inexpensive. Nosocomial infection surveillance is usually performed on inpatients only. However, during the outbreaks of SARS and seasonal influenza, for example, many hospital personnel were infected. In cases of this kind, in order to quickly detect the prevalence of such infections, a surveillance system that includes hospital personnel is essential. This surveillance is promising as a strategy to prepare for re-outbreaks of SARS and the emergence of novel influenza pandemics.

INTRODUCTION

Severe acute respiratory syndrome (SARS) emerged from 2002 to 2003. According to the World Health Organization (WHO), over 8,000 infected patients were reported during this period. A notable problem of SARS is the number of health care workers infected: at 1,706 persons, such cases accounted for 21% of all reported cases (1).

For the early detection of hospital outbreaks of acute respiratory infections (ARIs) that develop with a short incubation period and can spread by airway droplet transmission, such as SARS (2) and influenza (3,4), the surveillance method depends on the identification of specific “symptoms” as signs of a possible outbreak, with no need for specific diagnoses. Moreover, syndromic surveillance is quick, easy, and inexpensive. Nosocomial infection surveillance is usually performed on inpatients only. However, during the outbreaks of SARS and seasonal influenza, for example, many hospital personnel were infected. In cases of this kind, in order to quickly detect the prevalence of such infections, a surveillance system that includes hospital personnel is essential. This surveillance is promising as a strategy to prepare for re-outbreaks of SARS and the emergence of novel influenza pandemics.

MATERIALS AND METHODS

In Japan, ARIs are most prevalent in winter (from November to March), and this study was therefore performed during winter months. Basically, the first season of the period of study was from 2003 to 2004, the second season was from 2004 to 2005, and the third season was from 2005 to 2006.

Subjects showing both a fever of >38°C and respiratory symptoms were rated as having symptoms of ARIs and were included in the surveillance. Respiratory symptoms included upper airway symptoms (nasal discharge and sore throat), lower airway symptoms (cough, sputum, dyspnea, and reduced SpO2), or chest X-ray evidence of pneumonia. For each reported case with respiratory symptoms, the Infection Control Team (ICT) recommended a rapid test for influenza.

Subjects consisted of all patients hospitalized at the International Medical Center of Japan (IMCJ) hospital during the above-mentioned periods, in addition to the nurses, nursing assistants, physicians, laboratory technicians, pharmacists, administrative personnel, and students. If a case consistent meeting the definition of an ARI was identified, the head of each section immediately filled out a surveillance sheet and submitted it to an ICT. The ICT visited each ward every day, and had an interview with the head nurse, asking whether there were cases showing the target syndrome, and collected report papers. Report papers submitted on holidays were collected by the ICT on the next day, and each week after the collection, the results of the reports were documented on the hospital intranet for the hospital personnel. The IMCJ is a general hospital that is located in Tokyo. It has 925 beds and 28 health-care units. It also has 155 physicians, 585 nurses, 100 laboratory technicians and pharmacists, and 80 administrative personnel.

This study was approved by institutional review boards and the infection control committee of the IMCJ.

RESULTS

The numbers of cases that showed acute respiratory symptoms in each season are shown in Figure 1.

During the 106-day period from December 17, 2003 to March 31, 2004 (first season), 215 cases were reported. Rapid tests for influenza were performed on 109 individuals (51%), of whom 49 were rated as positive (the positivity rate was 23% of the total reported cases, and 45% of the rapid-tested cases). All positive cases were type A influenza. The surveillance period of the 1st season was comparatively short, because surveillance was performed as a provisional trial in this season. Reported cases included 168 inpatients (78%),

*Corresponding author: Mailing address: Disease Control and Prevention Center, International Medical Center of Japan, 1-21-1, Toyama, Shinjuku-ku, Tokyo 162-8655, Japan. Tel: +81-3-3202-7181, Fax: +81-3-3207-1038, E-mail: akawana@imcj.hosp.go.jp
25 nurses (12%), 14 physicians (7%), and 4 technologists (2%). The outcome of this provisional trial has already been reported (6).

During the 175-day period from November 7, 2004 to April 30, 2005 (the second season), 382 cases were reported. An obvious outbreak of acute respiratory symptom cases was observed in early February. Rapid tests for influenza were performed on 261 individuals (68%), of whom 169 were rated as positive (the positivity rate was 44% of the total reported cases, and 65% of the rapid-tested cases). This peak consisted of an influenza outbreak at our hospital. Influenza was rated as type B in 130 cases (77%) and type A in the remaining cases. Reported cases included 268 inpatients (70%), 68 nurses (18%), 29 physicians (8%), 8 technologists (2%), and 8 administrative personnel (2%).

When cases showing respiratory symptoms or many cases of influenza were observed, the ICT immediately performed an intervention and took measures such as the isolation of patients, strengthening of anti-infection measures, and recommendation of rest to hospital personnel with infection.

**DISCUSSION**

Usual nosocomial infection surveillance can be divided into two types: “hospital-wide surveillance” and “targeted surveillance” (7). Hospital-wide surveillance involves all patients managed at a given hospital. Its advantage lies in the fact that detection of the outbreak of nosocomial infection is easier with this type of surveillance. Its disadvantages are the amount of labor needed, low efficiency, and difficulty in comparing the results with those from surveillance at other hospitals.

The second type, or targeted surveillance, has the advantage of being generally effective and allowing easy comparison with the results of other hospitals. Targeted surveillance focuses on surgical-site, bloodstream, and urinary tract infection, and ventilator-associated pneumonia. However, targeted surveillance is not suitable for the early detection of diseases such as influenza and SARS, which tend to show sudden major outbreaks. Therefore, we need a much easier method of “hospital-wide surveillance” to detect these types of infection outbreaks. In the present study, we focused on the strategy of “syndromic surveillance” (5). Syndromic surveillance allows the rapid detection of sudden outbreaks, including infection caused by unknown pathogens. This approach depends on the identification of specific “symptoms” as signs of a possible outbreak, with no need for specific diagnoses. In recent years, this method has been used for the early detection of bioterrorism. Moreover, syndromic surveillance is quick, easy, and inexpensive.

The surveillance allowed the precise detection of outbreaks of influenza within our hospital during the survey periods. In particular, during the second season of the study, sudden outbreaks of influenza within our hospital were clearly documented. The peak of the outbreak in the hospital coincided with the peak of influenza prevalence in the whole of Japan reported by the National Institute of Infectious Diseases, Japan (8). However, further investigation is needed to fully elucidate the sensitivity and specificity.
Nosocomial infection surveillance is usually performed on inpatients only. However, during the outbreaks of SARS in 2003, many hospital personnel were infected, as previously mentioned (1,2). In cases of this kind, in order to quickly detect the prevalence of such infections, a surveillance system that includes hospital personnel is essential. The WHO has proposed a strategy called “SARS Alert” in preparation for a recurrence of the disease (9). This is a judgment standard stipulating that “if two or more health care workers have clinical evidence of SARS in the same health-care unit and with onset of illness in the same 10-day period, a recurrence of SARS must be suspected”. In order to detect cases that are consistent with the SARS Alert, a symptomatic surveillance that includes hospital personnel must be performed. Apart from SARS, there are many other ARIs that may involve hospital personnel, such as influenza, respiratory syncytial (RS) virus, and others. Even in the case of a major outbreak of a novel influenza virus, which is widely feared to be possible in the near future, a method of syndromic surveillance that includes hospital personnel will be effective. We were able to obtain clear information about infection among hospital personnel through the surveillance. For example, a significantly large number of personnel cases were reported during the influenza season (Figure 2). Highly infectious diseases such as influenza also induce outbreaks involving hospital personnel. Hospital personnel with respiratory symptoms immediately put on masks (10), and those who were found to have influenza were instructed to undergo treatment at home. As a result of these measures, it was possible both to control nosocomial infection and, simultaneously, implement treatment among hospital personnel who had fallen ill.

Finally, the problems associated with this method require some discussion. This surveillance adopted a method by which hospital personnel who detected a symptomatic case filled in a case report form and submitted it to the ICT. With this method, the cooperation of hospital personnel is indispensable. To gain adequate cooperation of personnel, it is necessary to provide information and an explanation about the planned surveillance to hospital staff. Since this method depends on “reporting” from the place of clinical practice, there is a possibility that the number of reported cases decreases with a decrease in the sense of impending crisis in physicians and nurses, which was suggested by the definite decrease in the number of reported cases after an influenza epidemic compared with the number before the epidemic in all 3 seasons (Figure 1). Ideally, this surveillance would be performed throughout the year. However, surveillance only during high-risk periods may be more practical. In addition, a prerequisite condition is the effective functioning of the teams responsible for initiating the anti-infection measures, such as the ICT.

We have proposed syndromic surveillance as a method for the early detection of outbreaks of ARIs in hospitals. This method is simple and quick, and can be performed by any hospital. It may be applicable to developing countries as well. This surveillance method is promising as a strategy to prepare for re-outbreaks of SARS and the emergence of novel influenza pandemics.

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