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# Contribution of technical guidance on nosocomial infection control to the containment of Severe Acute Respiratory Syndrome in Vietnam

Hiroshi Ohara\*

*Bureau of International Cooperation, International Medical Center of Japan, 1-21-1, Toyama, 162-8655, Shinjuku, Tokyo, Japan*

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**Abstract.** When Severe Acute Respiratory Syndrome (SARS) spread in Vietnam in March 2003, Bach Mai Hospital (BMH) contributed greatly to putting SARS under control by conducting strict nosocomial infection control. At BMH, technical guidance on nosocomial infection control had been implemented by Japanese experts since 2000. In addition, after the SARS outbreak, the Japan Disaster Relief Team was dispatched to assist in SARS control at BMH. SARS control in Vietnam was reviewed in reference to this technical guidance to investigate effective control measures. Major subjects of the technical guidance included the establishment of a control system, development of manuals and teaching materials, training of medical staff, and supplying protective attire. BMH provided medical care for 35 SARS cases; however, no nosocomial infection cases occurred leading to SARS containment. A swift reaction, effective nosocomial infection control, proper advice by the Ministry of Health and other elements are considered important factors in the success of SARS containment at BMH. In addition, the fruit of technical cooperation conducted under the project is regarded, to no small extent, as having formed the basis for this. Nosocomial infection control is a crucial factor in achieving high-quality medical care, as well as SARS control at the hospital level. © 2004 Elsevier B.V. All rights reserved.

*Keywords:* SARS; Vietnam; Nosocomial infection control; Technical cooperation project; Japan Disaster Relief Team

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## 1. Introduction

Severe Acute Respiratory Syndrome (SARS), which originated in Guangdong Province in China in November 2002, spread to 30 countries and regions, such as Hong Kong, Vietnam, China, Taiwan, Canada, and frightened the world until the “under control” declaration was issued by the World Health Organization (WHO) on July 4, 2003. In many

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\* Tel.: +81-3-3205-7860; fax: +81-3-3205-7181.

*E-mail address:* ohimej@kt7.so-net.ne.jp (H. Ohara).

hospitals to which SARS cases were admitted, nosocomial infections broke out, which facilitated the epidemic [1–4].

Under such circumstances, it is worthy of notice that Vietnam was the country that put SARS under control earlier than any other country [5]. The Bach Mai Hospital (BMH), which was the only medical institution to accept SARS cases after the middle of March 2003, contributed greatly to SARS containment in Vietnam by performing adequate nosocomial infection control.

At BMH, technical guidance on nosocomial infection control had been implemented by Japan since 2000. In addition, while SARS was in epidemic in Vietnam, the Japan Disaster Relief Team was dispatched to Vietnam to assist BMH. In this paper, SARS control in Vietnam was reviewed in reference to the Japanese contribution.

## **2. Before the SARS epidemic in Vietnam**

### *2.1. Bach Mai Hospital and the technical cooperation project*

Since its establishment in 1911, BMH, at the core of medical institutions in Hanoi, Vietnam, had been making a great contribution to the medical care of people living in the north of Vietnam.

A technical cooperation project (the Bach Mai Hospital Project) scheduled for a period of 5 years, had been implemented by Japanese experts (organized by the Japan International Cooperation Agency) since January 2000. The purpose of this project is to improve the quality of medical care at BMH and to disseminate better medical care to the north of Vietnam. The scope of the project comprises hospital management, clinical medicine, nursing management, laboratory management, and community medicine [6]. In this project, under the conviction that the consolidation and the establishment of an appropriate system for nosocomial infection control is a crucial factor for achieving high-quality medical care, technical guidance for nosocomial infection control had been incorporated as one of the programs [7].

Prior to the initiation of the technical cooperation project, a portion of the hospital wards and buildings for technical service was rebuilt using grant aid (construction completed in June 2000). BMH is now the largest general hospital in Vietnam, having 1400 beds and employing a staff of about 2000. In addition to ordinary medical care service, the hospital provides multilateral activities such as education and training of medical students, training of nurses and laboratory technicians, training of postgraduate doctors, technical guidance for other local hospitals, etc.

### *2.2. Technical guidance on nosocomial infection control*

Major subjects of the technical cooperation on nosocomial infection control included the establishment of an appropriate system consisting of surveillance and reporting, design and preparation of useful manuals and teaching materials, training courses organized for hospital staff and evaluation of the results, and a fact-finding study of nosocomial infection on 1679 inpatients.

The activities were started at the core of the Nosocomial Infection Control Department (NICD), which was organized prior to the initiation of the project. The staff of this

department included four doctors who had specialized knowledge and experience in nosocomial infection control. They carried out regular inspection tours through departments in the hospital and offered technical instructions for clean handling, disinfection, isolation, proper use of antibiotics, etc. When a case suspected of nosocomial infection was reported, the information was promptly conveyed to NICD for confirmation.

Training courses were held four times for the staff of BMH including doctors, nurses, etc. Each training course lasted for 1 month and was conducted for 50–100 trainees each time. Tests were performed before and after the training courses. With the results of the survey obtained by disseminating questionnaires to 125 trainees, the effects of the courses were evaluated. Furthermore, in the NICD, ad hoc training courses were organized for 4–6 doctors or nurses at BMH once or twice per month.

In order to clarify the actual status of nosocomial infection control at BMH, the fact-finding study on nosocomial infection was performed on 1679 inpatients. Based on the definition prepared by the NICD, suspected cases of nosocomial infection, which were reported from each department of BMH, were confirmed by the NICD. On each case thus confirmed, causative agents were identified at the bacteriology laboratory at BMH and an antibiotic sensitivity test was performed.

### 2.3. Effect of technical guidance for nosocomial infection control

After the initiation of the project, awareness and knowledge of nosocomial infection control were promoted among hospital staff at BMH, and a surveillance system was established. Under elaborate instructions and guidance by the NICD, adequate nosocomial infection control had been carried out using the manuals.

Results of the tests carried out on the trainees, before and after the training courses, revealed a 29.3 score elevation. Most of the trainees (95%) expressed that they felt a high degree of satisfaction after the training. From their replies, it was found that the hospital staff had better knowledge and higher awareness about nosocomial infection, and that they recognized the importance of hand washing and basic disinfection procedure for medical instruments and devices (Table 1).

In the fact-finding study, 100 cases were regarded as nosocomial infection. Among these cases, causative agents were identified in 49 cases. Out of 100 cases, 29 showed the infection to be related to surgical treatment. The causative agents detected at a higher frequency included *Escherichia coli* (9 cases), *Pseudomonas aeruginosa* (8 cases),

Table 1  
Survey on the results of training courses on nosocomial infection control, Bach Mai Hospital, Vietnam

Results	No.	%
Awareness for nosocomial infection was elevated	115	92
Hand washing was performed frequently and correctly	110	88
Disinfection of medical equipment was improved	83	66
Appropriate use of antibiotics was practiced	79	63
Clean handling technique was improved	56	45
Handling of blood samples was improved	53	42

Questionnaire survey was conducted 6 months after the training course for a total of 125 trainees (doctors and nurses) in Bach Mai Hospital, Vietnam. Results of tests conducted before and after training courses showed a 29.3 score elevation.

Table 2

Pathogens isolated from nosocomial infection cases Bach Mai Hospital, Vietnam

Pathogens	No. isolated	%
<i>Enterococcus</i>	12	24.5
<i>Escherichia coli</i>	9	18.4
<i>Pseudomonas aeruginosa</i>	8	16.3
<i>Acinetobacter baumannii</i>	7	14.3
<i>Candida</i> spp.	7	14.3
<i>Klebsiella pneumoniae</i>	3	6.1
<i>Staphylococcus aureus</i>	2	4.1
<i>Pseudomonas fluorescens</i>	2	4.1

This study was conducted for 1679 inpatients.

One hundred nosocomial infection cases were identified.

In 49 out of 100 cases, causative agents were identified.

*Acinetobacter baumannii* (7 cases), etc. (Table 2). The causative agents showing high resistance to antibiotics were recognized to a considerable extent.

### 3. After the SARS epidemic in Vietnam

#### 3.1. SARS in Vietnam

The first SARS case (index case) was detected in Vietnam on February 26, 2003. The patient was a 48-year-old businessman, a Chinese-American, who had been infected with SARS in Hong Kong. At the hospital where this patient was first treated (F Hospital), nosocomial infection occurred among hospital staff one after another [8]. Finally, 39 staff members, i.e., 65% of the total hospital staff, were affected with nosocomial infection. Furthermore, infection propagated to visitors and family members of the patients. The Ministry of Health ordered the closure of F hospital and the patients began to be moved to BMH on March 11. Since then, all new cases (who had a history of contact in some reason or other with F Hospital) were examined and treated at BMH (Fig. 1).

At BMH, all SARS cases were accommodated in the building of the Institute of Tropical Medicine, where intensive and effective nosocomial infection control measures were implemented. BMH provided medical care for 35 SARS cases, but no case of nosocomial infection occurred. From April 9 and after, no further SARS cases developed anew in Vietnam. On April 28, the Ministry of Health and the World Health Organization (WHO) issued the under control declaration for SARS in Vietnam [5]. All patients hospitalized at BMH recovered, and on May 2, the last of the SARS cases (2 men) were discharged from the hospital. In Vietnam, a total of 63 patients contacted SARS since the detection of the index case, and 5 of the patients died of the disease. Both the Ministry of Health and BMH offered accurate information on SARS, and they took a positive posture to accept the support and advice from foreign countries (Fig. 2).

#### 3.2. Dispatch of the Japan Disaster Relief Team

During the period March 16–April 1, 2003, the Japan Disaster Relief Team was dispatched by the Japanese Government. Protective attire, such as masks, gowns, goggles, etc., and two artificial respirators and disinfectants were also offered. Furthermore, in close

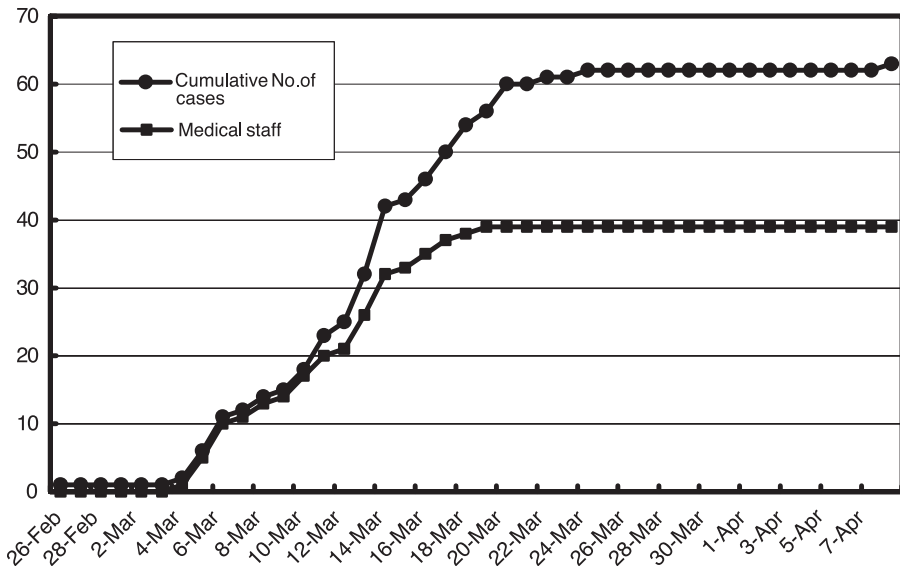


Fig. 1. Cumulative number of SARS cases in Vietnam. This figure was made based on the data of Bach Mai Hospital.

cooperation with the WHO, the Guidelines for SARS Infection Control was drafted. A special workshop for infection control was organized for the staff of the Ministry of Health, BMH and major hospitals in Hanoi. The instruments and the devices offered were effectively used, and were very helpful in infection control and lifesaving of severely infected patients.

### 3.3. Nosocomial infection control for SARS at Bach Mai Hospital

A total of 35 SARS cases had been treated at BMH up to the end of April without any nosocomial infection and death cases. After the nosocomial infection occurred frequently

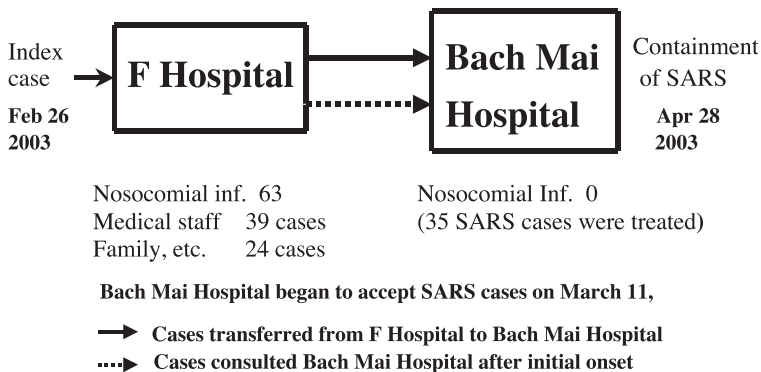


Fig. 2. Containment of SARS in Vietnam.

at F Hospital to which the index SARS case in Vietnam was admitted, the NICD at BMH maintained close contact with F Hospital and collected detailed information. BMH staff began to have knowledge about “a new type of pneumonia, which showed high infectious potency and strong pathogenicity and which must be observed under special vigilance and care.” Since the time when BMH began to admit SARS patients, all patients were isolated in the building of the Institute of Tropical Medicine, which belongs to BMH. The staff was ordered to have special vigilance, and strict and prompt actions for nosocomial infection control were taken (Fig. 3).

The following are the details of the actions taken for nosocomial infection control at BMH: (1) Infection preventive measures were taken, based on the manual for nosocomial infection control. (2) The building of the Institute of Tropical Medicine was offered exclusively for the medical care of SARS patients. (3) The instruments and devices for testing and examination were exclusively used for SARS patients, as practically as possible. (4) The patients were classified into three groups depending on the severity of the disease. (5) The severely infected patients were completely isolated from others. (6) The staff entering the isolation area was ordered to put on special protective attire according to the abovementioned classification (three groups). (7) The hospital was divided into three different zones, depending on the risk of infection. (8) Strict checking was performed on the staff entering the building of the Institute of Tropical Medicine so that follow-up would be easier when nosocomial infection occurred. (9) The family members of patients were prohibited from entering the building of the Institute of Tropical Disease (in addition, the access of the medical care staff to the building was restricted to the minimum). (10) Each member of staff entering the first floor of the building was asked to wear a mask and put on a special gown at the nurses’ station. (11) The masks, gowns, gloves, etc., already used were placed into yellow bags to discriminate for disposal. (12) Strict standards for discharge of patients from the hospital were enforced, i.e., the



Fig. 3. A medical staff with complete protective attire, who is treating a serious SARS patient. This photo, was offered by Bach Mai Hospital.



standards for chest X-ray examination and blood test findings, or hospitalization of patients for 5 days after the alleviation of fever.

#### **4. Discussion**

There have been a number of studies reporting a high incidence of nosocomial infection at hospitals in the developing countries [9–12]. However, in actual fact, proper measures are not taken sufficiently in most of the hospitals. The leading route of SARS infection is through droplets from the patients, and it has been reported that many medical staff and visitors to the hospitals, who were near the patients, were infected [2,4,8,13,14].

The suspected reasons why SARS control was successfully carried out in Vietnam include: (1) swift reaction, (2) effective nosocomial infection control, (3) efficient international cooperation, (4) accurate information sharing, (5) isolation of SARS patients to a single place, (6) proper advice by the Ministry of Health, and (7) efforts of medical staff. As the sole hospital to accept SARS cases in Vietnam after the middle of May 2003, BMH played a very important role. Besides, it appears that the technical guidance given under the project made a great contribution as the basis of the successful SARS control. Dispatch of the Japan Disaster Relief Team also helped to implement effective infection control and respiratory management.

Through repeated training courses, conducted before the SARS epidemic, the staff at BMH had reached a higher level of skills and an effective nosocomial infection control system began to function. Special emphasis was put on nosocomial infection control, and medical staff was engaged in hospital service under strict preventive measures. Awareness and preparation against nosocomial infection had already been upgraded among hospital staff when the SARS epidemic broke out in Vietnam.

After the SARS outbreak, the nosocomial infection control system at BMH could provide high effectiveness in close cooperation with the Ministry of Health. The patients were isolated promptly and completely, and the standard precautions as well as infection control targeted to SARS were carried out in successful infection control. Up to the declaration of SARS containment in Vietnam on April 28, neither nosocomial infection nor a death case has been reported there. These results imply that the spread of SARS infection can be prevented to a considerable extent if adequate preventive measures are taken.

Because the hospital staff had built up their knowledge and ability during 3 years of training, they could achieve successful results and take adequate actions for SARS control. The NICD in BMH provided proper management and guidance for the control of this disease. Preventive measures have been taken according to the manual for nosocomial infection control prepared under the project and in accordance with the Guidelines for SARS Infection Control supported by the Disaster Relief Team in cooperation with WHO.

In developing countries with high incidences of infectious diseases, nosocomial infection control is very important and effective measures are required [15]. First, special emphasis must be placed on observance of basic techniques (standard precautions) such as hand washing and the wearing of masks. The enlightenment activities, such as distribution of manuals and teaching materials and the organizing of training courses for the medical staff, are very useful and effective for the improvement of nosocomial infection control.



Furthermore, detailed status of nosocomial infection and causative agents should be strictly monitored, and antibiotics must be correctly used [16,17]. At BMH, the monitoring of nosocomial infection rate is used as one of the indices to determine the quality of medical care. For this purpose, results of the fact-finding study as described in the present article are used as an effective basic data.

Nosocomial infection control is a crucial factor to provide high-quality medical care. Appropriate practice of precautions against droplets and contact is essential for protection against SARS [18,19]. Besides, more importance should be put on training of medical staff to enhance basic techniques and establish control systems at ordinary times, not starting after the outbreak of epidemics. Such a basis will make it possible to apply stringent nosocomial infection control promptly when outbreaks of SARS or other emerging diseases occur.

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