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ORIGINAL ARTICLE

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Fact-finding survey of nosocomial infection control in hospitals in Vietnam and application to training programs

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Abstract Nosocomial infection control is crucial for improving the quality of medical care. It is also indispensable for implementing effective control measures for severe acute respiratory syndrome (SARS) and the possible occurrence of a human influenza pandemic. The present authors, in collaboration with Vietnamese hospital staff, performed a fact-finding survey of nosocomial infection control in hospitals in northern Vietnam and compared the results with those of a survey conducted 4 years previously. Remarkable improvement was recognized in this period, although there were considerable differences between the central hospitals in Hanoi and local hospitals. In the local hospitals, basic techniques and the systems for infection control were regarded as insufficient, and it is necessary to improve these techniques and systems under the guidance of hospitals in the central area. Based on the results of the survey, programs were prepared and training courses were organized in local hospitals. Evaluation conducted after the training courses showed a high degree of satisfaction among the trainees. The results of the survey and the training courses conducted during the study period are expected to contribute to the improvement of nosocomial infection control in remote areas of Vietnam

Key words Infection control · Survey · Nosocomial infection · Vietnam

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Introduction

In hospitals in developing countries where the incidence of infectious diseases is high and the environmental conditions of the hospitals are poor, nosocomial infection may occur frequently.[1–5] However in actual fact, little importance has generally been placed on infection control in these countries so far.

Since the year 2000, the present authors, in close cooperation with the Ministry of Health (MOH) and major hospitals in Vietnam, have been trying to strengthen the capacity for nosocomial infection control in hospitals. Our major efforts have focused mainly on the following points: the establishment of a reliable system for nosocomial infection control, the organization of training courses, implementation of appropriate infection control measures in the event of a severe acute respiratory syndrome (SARS) epidemic,, and fact-finding surveys of nosocomial infection control.[6,7] In the year 2003, i.e., immediately after the SARS epidemic, the first fact-finding survey of nosocomial infection control in hospitals in the north of Vietnam was carried out, and it was noted that awareness of nosocomial infection control was increasing, but the levels of knowledge and the quality of the infection control systems, as well as the preparation of necessary equipment for effective nosocomial infection control, were still poor.[8]

In 2007, a second fact-finding survey of nosocomial infection control in hospitals in the north of Vietnam was performed, and the results were compared with those obtained in 2003. The primary purpose of this study was to evaluate progress in the nosocomial infection control situation and to prepare the basic information needed to provide further technical guidance. Furthermore, based on the results of the second survey (the present study), training programs were prepared and training courses were organized for the medical staff in local hospitals.

Materials and methods

Outline of healthcare system in Vietnam

In regard to administrative divisions, Vietnam consists of 61 provinces, and each province consists of 6–12 districts (i.e., districts are under provinces). The healthcare system in Vietnam has three levels of hospitals (i.e., central, provincial, and district hospitals), plus community health centers. Central hospitals, which are under the direct control of the MOH located in big cities, provide medical service as top referral hospitals. In each province, in general, there is one general hospital (provincial hospital) and in each district, one general hospital (district hospital). These hospitals are under the control of provincial health departments and are responsible for the medical care of the people of the province and district, respectively. Under the control of the district hospital, community health centers provide healthcare at the grassroots level.

In Vietnam, a system to provide technical guidance from upper- to lower-level medical institutions (i.e., national hospitals→provincial hospitals→district hospitals→community health centers) exists, although at present the system does not always function well. However, it is noteworthy that recently central hospitals have often been providing technical guidance (including training courses) for provincial hospitals (and occasionally for district hospitals).

Fact-finding survey of nosocomial infection control

In 2007, a survey was performed by disseminating questionnaires to 51 hospitals (6 central [national] hospitals in Hanoi, 32 provincial hospitals [i.e., the provincial hospitals in each of the 32 provinces in the north of Vietnam], and 13 district hospitals) in the north of Vietnam. The number of beds in the hospitals in the present study was as follows: national hospitals (600–1500), provincial hospitals (250–500), and district hospitals (80–250).

The above 51 hospitals play a key function in the areas where they are located, and high expectation is placed on improvements in their nosocomial infection control capacity. The contents of the survey included control systems, the surveillance situation, the training situation, equipment preparedness, and existing problems. The responders were those hospital staff who were responsible for nosocomial infection control, or the directors of the hospitals. In some of the hospitals, the survey was also conducted by direct observation and interview with hospital staff. The results of the present survey were compared with those obtained in the survey of 2003. Statistical analysis of the results, comparing findings among the three levels of hospitals (central, provincial, and district hospitals) and comparing the findings in 2003 and 2007, was done with the χ^2 test and *t*-test, respectively.

Organization of training courses

Based on the results of the present survey and requests from the target hospitals, training courses were designed and carried out (2007–2008). The training courses were organized focusing on hospitals located in remote areas: (area 1) Tuyen Quang, (area 2) Lang Son, (area 3) Mong Cai, (area 4) Dien Bien, (area 5) Lao Cai, and (area 6) Thai Nguyen. Areas 2, 3, and 5 are located near the Chinese-Vietnamese border, and area 4 is near the Lao-Vietnamese border. These border areas are important land transportation and trade hubs with the potential to become points of intrusion for various infectious diseases. Under such circumstances, it is crucial to enhance nosocomial infection control as well as strengthening medical care for infectious diseases at hospitals.

Training courses were conducted at provincial hospitals (areas 1, 2, 4, and 5), a district hospital (area 3), and a national hospital (area 6). In the hospitals in areas 1, 3, 4, 5, and 6 a training course was held once during the study period, while in the hospital in area 2 training courses were held twice. In each training course, 54–86 medical staff, including doctors and nurses in high-risk departments (such as intensive care units [ICUs]; Surgery; Emergency; and Obstetrics and Gynecology) along with management staff responsible for nosocomial infection control participated as trainees. The duration of the training course was 3 to 5 days and in each training course some trainees from the lower-level hospitals in these areas were also invited, in addition to the staff of the hospital where the training course was held. Training programs emphasized the high importance of standard precautions such as hand hygiene, disinfection, and sterilization procedures. Guidance on setting up control systems, the use of antibiotics, bacterial resistance, and control measures in case of the possible resurgence of SARS or the occurrence of a human influenza pandemic was also included.

Tests were conducted before and after the training course (on 336 trainees) in order to evaluate the effectiveness of the training course. The test was marked out of a maximum of 100 marks; questions were compiled in accordance with the basic knowledge of nosocomial infection control in the trainees. The post-course tests were designed to be more difficult than the pre-course tests. Also, evaluation was done by disseminating questionnaires to trainees after the training course.

The actual status of nosocomial infection control was investigated in the hospitals where a training course was held. Further, technical instructions on the appropriate management of an infection control department (ICD) and an infection control committee (ICC) were given to hospital management staff.

Results

Fact-finding survey of nosocomial infection control

Control systems

In 2007, hospitals with an ICD accounted for 86.3% of all hospitals, a significant increase compared with the results in 2003 ($P < 0.05$; the proportion of hospitals with an ICD was

51.2% in 2003). However, in 2007, the proportion of district hospitals with an ICD was significantly lower than the proportion of national and provincial hospitals with an ICD ($P < 0.05$; Fig. 1A). In 2007, an ICC had already been set up in all but 1 of the 51 hospitals in the survey (apart from 1 district hospital; 50/51). In district hospitals, a significant increase was recognized during the 4 years between the two surveys (Fig. 1B). However, the ICC met only twice annually in 88.0% (44/50) of all hospitals, and it was noted that the operations of these committees were neither adequate nor satisfactory. In 2007, the guidelines for infection control were in use in 100% of the hospitals (Fig. 1C); hospitals that had prepared guidelines by themselves accounted for 23.5% of all hospitals. However, most of these guidelines had been made more than 5 years previously and some contents were regarded as not suitable for recent infectious disease situations and antibiotic use.

Surveillance situation

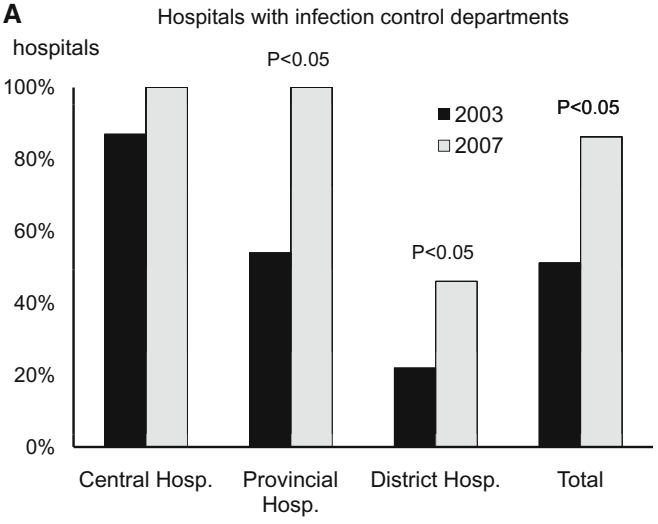
In 2007, surveillance of nosocomial infection was carried out in 13.8% of all the hospitals in the survey, according to the reports from clinical departments (33.0% of central, 14.3% of provincial, and 0% of district hospitals); in the survey of 2003, surveillance of nosocomial infection was carried out in 7.3% of all hospitals (Fig. 2A). In 2007, the proportions of central, provincial, and district hospitals in which bacteriological tests were performed in cases of nosocomial infection were 100%, 91.0%, and 15.0%, respectively. The proportion of district hospitals performing these tests was significantly lower than that of the national and provincial hospitals ($P < 0.05$; Fig. 2B).

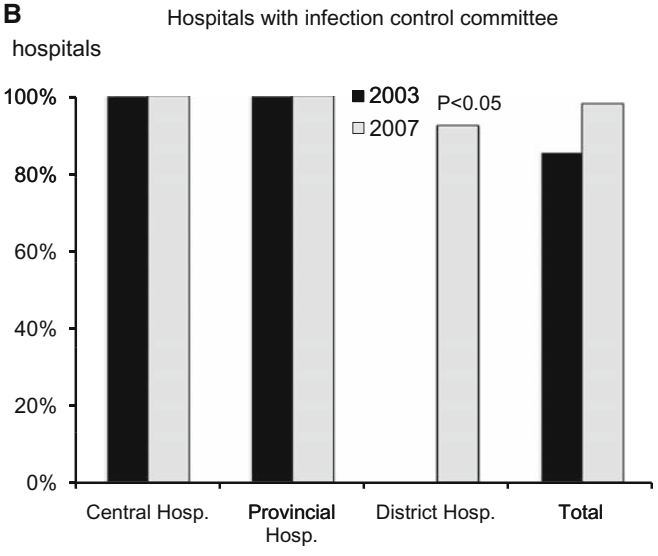
Training situation

The survey of 2007 showed that in 90.2% of all hospitals (100% of national, 96.9% of provincial, and 69.2% of district hospitals) training courses on nosocomial infection control had been organized within the past 1 year (in the survey of 2003, the proportion of all hospitals organizing such courses was 75.6%; Fig. 3). In 86.3% of all the hospitals training course on SARS and/or avian influenza had already been conducted.

Equipment preparedness

In the survey of 2007, 84.3% of all hospitals met the criteria of the MOH for the standard requirements for personal protective equipment (18% met these requirements in the





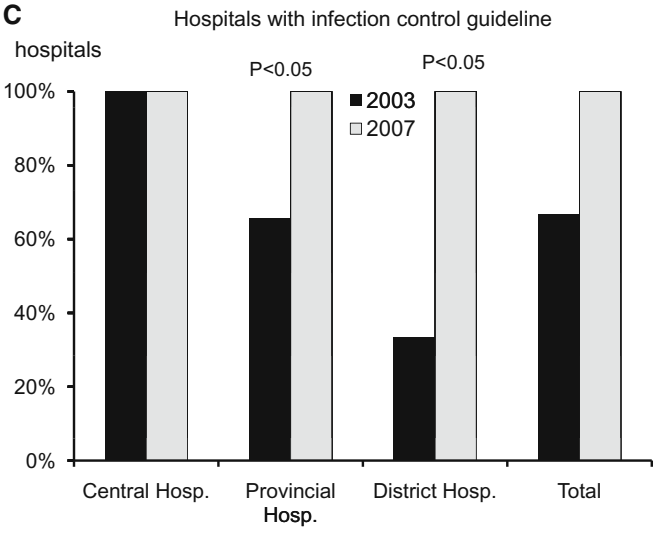


Fig. 1. **A** In 2007, hospitals with an infection control department (ICD) accounted for 86.3% of all hospitals in the survey (51.2% in 2003). The proportion of district hospitals with an ICD was significantly lower than that of national and provincial hospitals ($P < 0.05$). **B** In 2007, in all but 1 of the 51 hospitals in the survey (apart from 1 district hospital; 50/51) an infection control committee (ICC) had already been set up. **C** In 2007, a guideline for infection control was in use in 100% of the hospitals (66.7% in 2003)

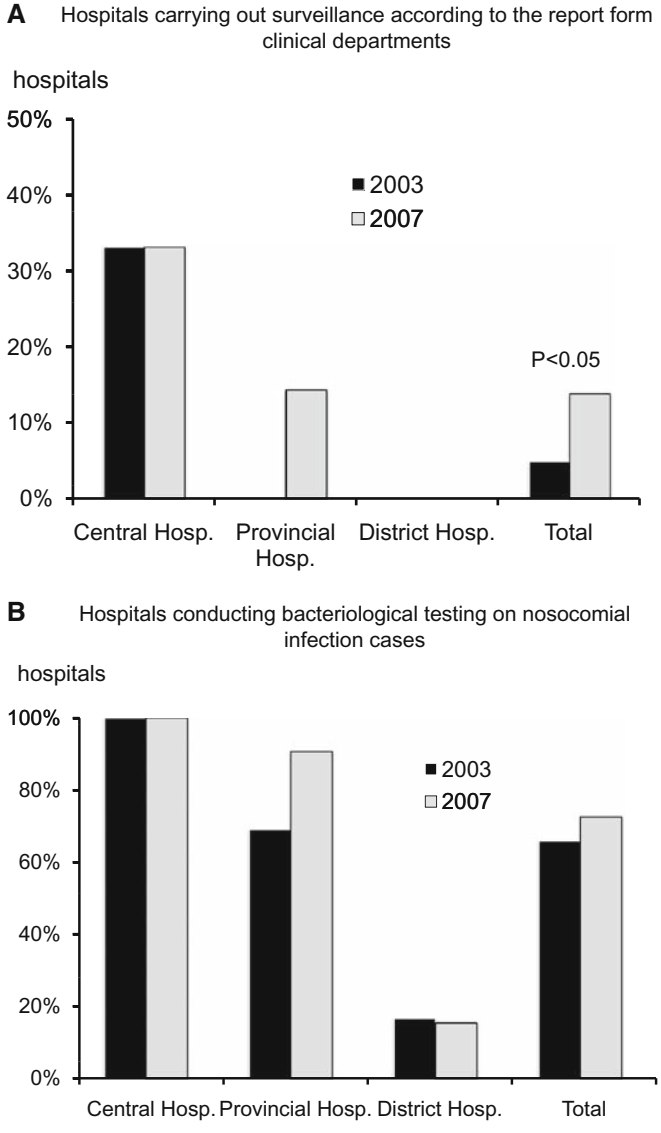


Fig. 2. **A** In 2007, surveillance of nosocomial infection was carried out in 13.8% of all hospitals according to the reports from clinical departments (7.3% in 2003). **B** In 2007, bacteriological tests had been performed on cases of nosocomial infection in 100%, 91.0%, and 15.0%, respectively, of central, provincial, and district hospitals. The proportion of district hospitals carrying out these tests was significantly lower than that of national and provincial hospitals ($P < 0.05$)

survey of 2003; Fig. 4A). In 2007, The proportions of hospitals satisfying the standard requirements for the quantities of protective items stipulated by the MOH were as follows: surgical masks (74.5%), N95 masks (84.3%), gloves (100%), and gowns (78.4%). In 2007, 90.2% of all hospitals replied that they had sufficient amounts of disinfectants (31.7 % in 2003; Fig. 4B). In 2007, 88.2% of all hospitals had a prepared isolation area (Fig. 4C), but no hospital was equipped with a negative pressure room. In 60% of all the hospitals respondents replied that patients could be admitted in a human influenza pandemic.. Significant increases between 2003 and 2007 were recognized in the proportions of hospitals meeting requirements for protective items, disinfectants, and isolation areas ($P < 0.05$).

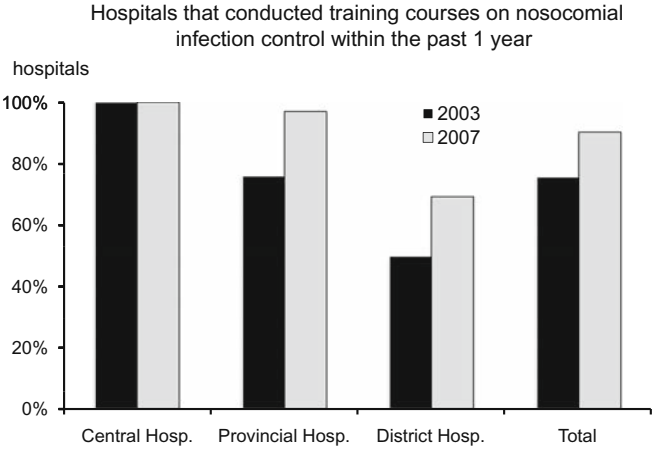


Fig. 3. In 2007, training courses on nosocomial infection control had been organized in 90.2% of all hospitals within the past 1 year (75.6% in 2003)

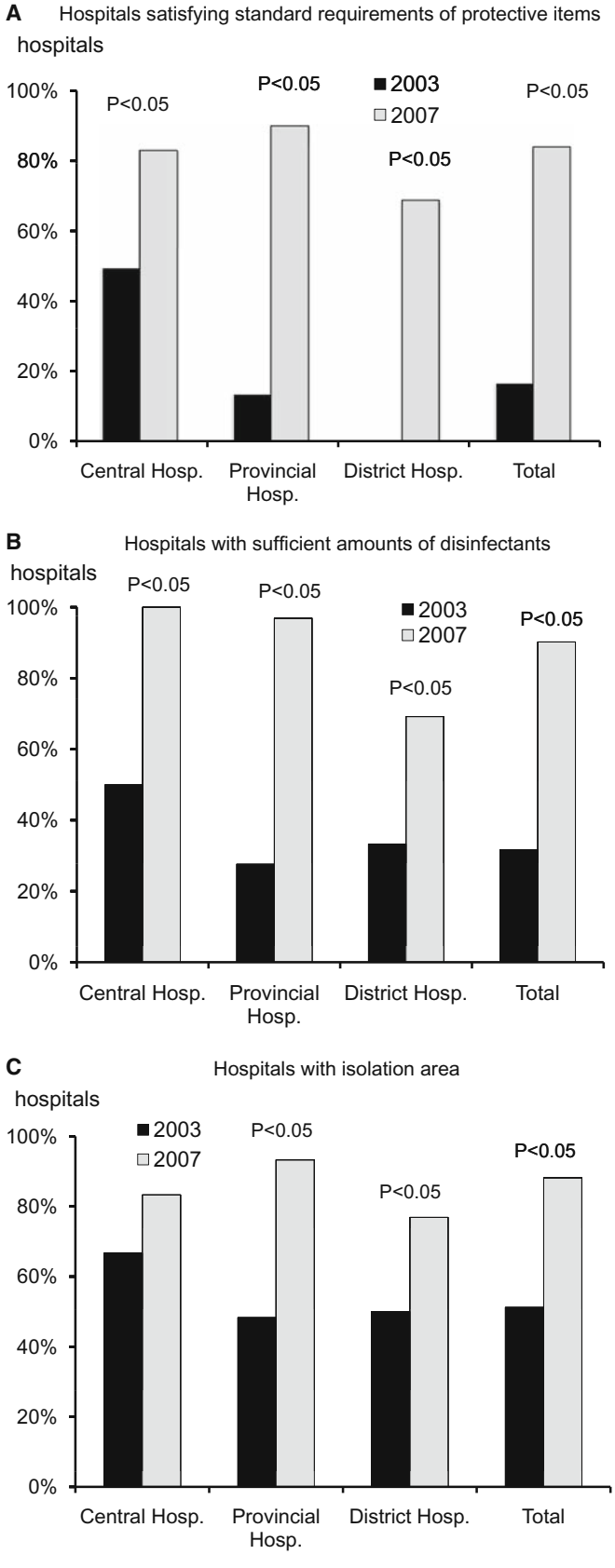
Existing problems

Leading problems were found in lack of equipment, lack of personnel, inadequate practice of basic techniques including standard precautions, weak ICD and ICC function, lack of knowledge among hospital staff, and few training opportunities (Fig. 5). Particularly, inadequate practice of basic techniques such as hand hygiene and disinfection and sterilization methods was pointed out as the most urgent problem to be overcome in provincial and district hospitals.

Organization of training courses

In the results of the questionnaire survey, considerable differences were noted in the capacities for nosocomial infection control between the hospitals in Hanoi City and the hospitals in other local areas, and it was recognized as quite important to consolidate the basic techniques and systems for nosocomial infection control in local hospitals. These results obtained from the present survey were incorporated in the programs, and training courses were organized.

The tests conducted after the training courses showed an increase of 28 marks (out of 100) on average compared with the marks before the courses. The replies on the questionnaires were as follows: “The training courses were useful and beneficial” (100%); “The contents of the courses were adequate and satisfactory” (96%); “The teaching materials were good and useful” (92%); “The teaching method was adequate and satisfactory” (88%); and “Satisfied with the training courses” (98%). All six hospitals where the training courses were held had an ICD and an ICC: however, the actual operations of the ICD and the ICC were not satisfactory and the hospitals were requesting technical guidance from central hospitals. In the training conducted by these hospitals themselves, problems such as insufficient training of the staff, inadequate quantity and quality of the materials and equipment, and lack of the latest information were suggested.



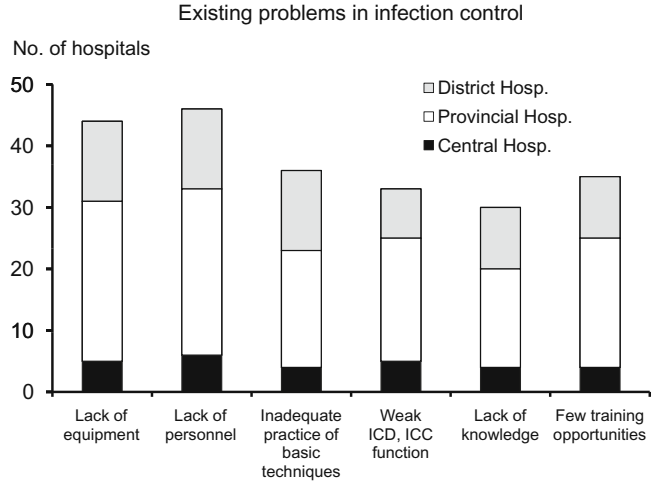


Fig. 5. In the survey in 2007, leading problems were found in lack of equipment; lack of personnel; inadequate practice of basic techniques, including standard precautions; weak ICD and ICC function; lack of knowledge; and few training opportunities

Discussion

In 1997 the MOH of Vietnam issued regulations on hospital infection control and instructed every hospital to establish an ICC and/or ICD, and in 1998 the first ICD was introduced at Bach Mai Hospital, the biggest national hospital in Hanoi City. Since then, efforts have been made to improve the infection control system, along with upgrading the abilities of hospital staff. In 2003 Vietnam successfully contained a SARS epidemic, for the first time in the world, by taking proper infection control measures.[9,10] Since the time when SARS prevailed in the country, awareness of nosocomial infection control among hospital staff has been increasing in Vietnam.

In the results of our fact-finding survey of 2007, progress and improvement were noted in items of investigation including management, surveillance, training situation, and equipment preparedness in comparison with the 2003 survey results. However, it was noted that there were still big differences between the central and local hospitals (particularly in regard to district hospitals). Generally, in remote areas, the financial situation is poor and hospitals lack personnel and have limited opportunities to get the latest information and refresher training. Disparity between central and remote areas still exists not only in regard to infection control but also in many other medical aspects, this being one of the existing problems in medical care in Vietnam.

The present study suggested that although the proportions of hospitals with an ICD and an ICC have increased, the experience and skill required for the operation of these entities were still unsatisfactory. Infection control guidelines

Fig. 4. **A** In 2007, 84.3% of all hospitals met the criteria of the Ministry of Health (MOH) for the standard requirements for personal protective equipment (18% in 2003). **B** In 2007, 90.2% of all hospitals replied that they had a sufficient amount of disinfectants (31.7 % in 2003). **C** In 2007, 88.2% of all hospitals had prepared an isolation area

had been adopted by all the hospitals, but the contents were old and not practiced appropriately. Besides, basic techniques such as hand hygiene and disinfection methods, which are considered to be essential matters for implementing effective nosocomial infection control, were still showing insufficiency. The proportion of hospitals conducting surveillance of nosocomial infection had increased compared with the results of the 2003 survey, but numbers were still limited, particularly in local areas. These findings suggest the necessity for more intensive measures to be taken to improve the quality of infection control. Also, in view of the recent increase in bacterial resistance to antibiotics, which is one of the leading causes of nosocomial infection, appropriate use of antibiotics, based on accurate bacteriological testing, along with appropriate guidelines, is required.

Based on the results of the 2007 survey, training courses for nosocomial infection control were designed and executed at local hospitals (particularly in border areas). In the programs, special attention was paid to basic problems such as the practice of standard precautions, as well as the appropriate operation of an ICD and ICC. Measures for infection control against SARS and a human influenza pandemic, diseases which are threatening resurgence or occurrence, were also included. A high degree of satisfaction was found in the questionnaire survey that was done after the training courses. Moreover, it is expected that technical instructions and guidance, which were conducted in parallel to the training courses in order to ensure adequate operation of the ICD and surveillance, will contribute to improvements in local hospitals.

Nosocomial infection control is crucial for the provision of high-quality medical care services. When seen from a short-term viewpoint, such control measures may seem to be costly and to consume resources. However, from a mid-term or long-term viewpoint, these measures will contribute to the reduction of unnecessary costs and may benefit hospital financial conditions. During the SARS outbreak in 2003 in many countries, the infection expanded due to insufficient nosocomial infection control, and there were serious effects not only on hospitals but also on the local economy in the afflicted areas.[11,12] This fact clearly indicates the importance of the strict and timely execution of nosocomial infection control.

Fortunately, there has been no resurgence of SARS, but there is a rising fear about the development of a human influenza pandemic.[13,14] It is anticipated that nosocomial infection will become a serious problem if a human pandemic occurs and human-to-human infection may be common.[15] It is considered to be quite useful to carry out adequate nosocomial infection control in dealing with a possible human influenza pandemic. Particularly, emphasis should be made on the training of medical staff to enhance their fundamental skills and to establish an appropriate control system at ordinary times, not after the outbreak of an epidemic.

Hereafter, in Vietnam in order to improve the quality of nosocomial infection control, there is a strong requirement for more improvement in local hospitals and improvements in technical guidance from central hospitals to these hospitals. In particular, there is an urgent need to strengthen fundamental techniques such as hand hygiene, provide guidance on the appropriate operation of an ICD and ICC, and prepare appropriate guidelines.[16] We have been collaborating in the survey of nosocomial infection control in Vietnam since 2000. We believe that this collaboration has made some contribution to the improvement of nosocomial infection control in Vietnam.

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