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新界東醫院聯網
NEW TERRITORIES EAST CLUSTER

Quality Effective Health Care

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10 January 2004

Miss Flora TAI
Clerk to Select Committee
Legislative Council
Hong Kong Special Administrative Region
of the People's Republic of China
Legislative Council Building
8 Jackson Road Central
HONG KONG

Dear Ms Tai,

Select Committee to inquire into the handling of the Severe Acute Respiratory Syndrome outbreak by the Government and the Hospital Authority

I submit the following documents for the Select Committee hearing on 17 January 2004 :-

(1) My response to the questions raised by the Select Committee;

(2) My views on the performance and accountability of the management of New Territories East Cluster and Prince of Wales Hospital in the handling of SARS outbreak; &

(3) Details of my professional qualifications and experience.

I do not have additional statement on the specified areas of study as I have detailed everything in the response to the questions.

Yours sincerely,

(Dr FUNG Hong)
Cluster Chief Executive
(New Territories East)
Hospital Authority

醫院管理局
HOSPITAL AUTHORITY

Response to Questions Raised by the Select Committee
(January 2004)

1. Union Hospital requested PWH to take over the patient in anticipation the patient might need ventilation support and prolonged course of recovery. This is a normal practice of the private hospitals requesting HA hospitals to take over ill patients. The patient was transferred to the Accident & Emergency Department of PWH by ambulance.

2. There was a referral letter signed by Dr. Ho Kwun Wai of UH indicating the patient status, symptoms and treatment provided at UH as well as the reason for transfer to PWH. When the patient attended the Accident & Emergency Department (AED), she was in critical condition and was transferred directly to the Intensive Care Unit (ICU). The diagnosis was severe community-acquired pneumonia. In the AED, the patient was put into a single resuscitation room. All the 4 staff who attended the patient adopted universal precautions and wore surgical masks and gloves for direct contact with the patient. In the ICU, the patient was isolated in a single room right from the time of admission and droplet precautions were adopted upon the recommendation of the Infection Control Team. The Infection Control Team recommended droplet precaution measures for caring the patient in the ICU in view of her travel history to the Mainland and the occurrence of an earlier Avian Flu case. Staffs in ICU were in full personal protective equipment. We did not know about the case of [redacted] from Guangdong at the time when the patient was admitted. I first heard about [redacted]'s case on 24 February through Dr. Yip Wai Chun of KWH who mentioned it to me, in passing, at a meeting of the Cardiothoracic Surgery Specialty Group at the HA Head Office (HAHO). Dr. Yip told me that Professor Liu was suffering from severe pneumonia with respiratory failure. We were not aware of what precautionary measures were taken in handling Professor Liu's case and therefore could not compare.

3. The index patient of PWH was admitted on 4 March. Prior to his admission, the patient attended the PWH AED on 28 February for the symptoms of cough and chills. The diagnosis then was upper respiratory tract infection. He was treated and discharged from the AED. He returned to the AED on 4 March with persistent symptoms, mainly cough and whitish sputum. Chest x-ray showed pneumonic changes. He was then diagnosed to have community-acquired

pneumonia. The prevailing infection control measures for the general patients at that time was universal precautions, which involves wearing gloves for touching blood or body fluids, changing gloves between patients, wearing goggles, masks and aprons if there is anticipated splashing of body fluid and washing hands. The need for more upgraded protection would be based on the clinical judgment of individual clinician. At the time when the patient was seen, our healthcare workers at the AED did not take the special precautions recommended for patients with "Severe Community-acquired Pneumonia" because the index patient was not such a patient. After our confirmation of that particular patient as the index patient, we could link his two visits to the infection of 3 doctors and 3 nurses.

4. Please refer to the answer to Question 3 above. When the patient was admitted on 4 March, his condition was stable. He did not require ventilation or admission into the ICU. He did not satisfy the criteria of "Severe Community-acquired Pneumonia" according to HA's memo of 21 February.

5. On 4 March when the patient was admitted to the ward, the healthcare workers practiced universal precautions and did not take the special precautionary measures recommended for caring of patients with "Severe Community-acquired Pneumonia". When the patient from UH was transferred on 22 February, there was a clear diagnosis of "Severe Community-acquired Pneumonia".

6. I was first aware of 7 doctors and 4 nurses went on sick leave on the same day on 10 March. Dr. Philip Li, Deputy Hospital Chief Executive of PWH, informed me of this. The PWH management considered the clustering of healthcare workers going on sick leave from the same medical department to be an outbreak. The Infection Control Team, with Dr. Donald Lyon (consultant in microbiology) and Professor Augustine Cheng (professor and Chief of Service in microbiology), was immediately consulted to investigate on the cause of the outbreak and the necessary precautionary measures. As the doctors had also been seeing patients in other clinical areas, it was not certain at the beginning if there were other sources of infection. Since most of them were the ward 8A doctors and nurses, an upgraded droplet precaution was introduced to the ward. This included the use of surgical mask, gloves and gowns for all healthcare workers in the ward. The ward 8A was temporarily closed to all admissions, discharge and visitors.

7. Ward managers would usually report any significant number of staff on sick leave to the Departmental Operating Manager. At the time of the outbreak, staff infections were reported directly to the infection control nurses by wards in the same way as infections in patients. We have reviewed the infection control records at PWH from 1993 onwards and have not located any large clusters of staff sickness due to infectious diseases. There were documented staff infections of chickenpox related to patient cases. Extensive screening for chickenpox in staff had been undertaken in response to patient cases, but the number of affected staff was small. The last time when PWH had a large group of staff on sick leave was due to an outbreak of Salmonella food poisoning associated with food from the staff canteen in the late 1980s.

8. Dr. Donald Lyon, consultant microbiologist at PWH, informed Dr. SH Liu, Convener of the Task Force in Infection Control, of the HAHO in the afternoon on 10 March. Dr. Donald Lyon also notified the Department of Health (DH) New Territories East (NTE) Regional Office. In addition, Dr. SH Liu notified Dr. LY Tse of DH in the morning of 11 March. Dr. Au Tak Kong from the DH NTE Regional Office subsequently attended the outbreak meeting at PWH at noon on 11 March.

I had a meeting with Dr. Ko Wing Man early in the morning of 12 March attended also by Drs. Philip Li and Donald Lyon to keep Dr. Ko informed of the development of the ward 8A situation. In the evening of 12 March, we had another outbreak management meeting at PWH that involved the hospital management, colleagues from the Department of Medicine, the Infection Control Team and the Dean from the Chinese University of Hong Kong (CUHK). Dr. Ko Wing Man also attended the meeting on behalf of the Chief Executive of HA (CE/HA). The staff infection situation and the contingency measures were discussed.

The 8A situation was discussed at the combined meetings of the Central Committee on Infection Control and Expert Group on Severe CAP held at HAHO on 12, 14 & 18 March. The meeting on 12 March was attended by Dr. Donald Lyon and Professor David Hui from PWH. The meeting on 14 March was attended by Dr. Donald Lyon from PWH and the meeting on 18 March was attended by Drs. Donald Lyon, Nelson Lee & SF Lui from PWH. Dr. Nelson Lee was our specialist in infectious diseases in PWH; Dr. SF Lui was the

Service Director in Risk Management & Quality Assurance in NTEC. At the meeting on 12 March, we presented information on the numbers and types of staff affected, their clinical presentations and preliminary laboratory findings, as well as information on the screening clinic set up the previous evening. Precaution measures were discussed, re-stating of droplet precautions being appropriate. On 14 March, Dr. Donald Lyon presented a further update on the cases, the clinical features, the laboratory results, and the contingency measures taken by PWH. Points raised at the meeting were the use of the N95 mask, whether it was necessary, and a request for more detailed epidemiological data. On 18 March, Dr. SF Lui presented a more detailed description of the epidemiology of the 8A outbreak, including the index case and the finding of the nebulizer being the cause of extensive infection outbreak. The nebulizer issue was discussed and the HA guideline was altered to advise against nebulizer use in patients with fever and Chest x-ray infiltrates.

9. Ward 8A was temporarily closed to admission, discharge and visiting in the afternoon of 10 March. There was no immediate moving out of the patients out of the ward. Patients were cohorted in the ward so that those clinically suspected to have got the infection were put together at the rear cubicles of the ward while the others were grouped together at the front cubicles of the ward. The ward was closed because there was an apparent outbreak of infection requiring investigation. However, we also started to make arrangements to open a ward on 11/F to take in the chronically ill patients who were considered to be uninfected and whose condition could not be discharged. A total of 7 patients were transferred to the new ward for cohorting on 14 and 15 March. Only one of them was eventually found to have SARS. Dr SF Lui, representing the hospital management, Dr. Donald Lyon and the Chief of Service in the Department of Medicine, made the decision jointly. They got endorsement from me for the decision. We did not consult the Head Office, HA Board, DH or Health, Welfare & Food Bureau (HWFB) before making the decision. We did not consider any legal issues at that moment.

10. We did not re-open ward 8A to full visiting. We only allowed restricted visiting to ward 8A for the immediate family members on 11 March. We were informed that there were complaints from relatives and patients against our initial strict no visiting policy and it was difficult for the nurses to implement the policy in the evening of 10 March as there had not been any prior public announcement. There was the fear that patients might discharge themselves against medical

advice and we would have no authority to stop them. For patients who got fever and who were potentially infected and infective, this would lead to the risk of spreading the infection into the community. We discussed about the authority to quarantine healthy contacts or non-infected persons and concluded that such authority did not rest with the hospital. The advice from our Infection Control Team also suggested that the precautionary measures that we introduced on the first day should be sufficient to protect the visitors. When the issue was discussed in our noon meeting on 11 March, Dr. Au Tak Kong was present and he was invited to provide public health advice and input to contain the spread of the infection. There was no disagreement to the visiting restriction policy. In fact, on 11 March, virtually all visitors were turned away.

11. Under our visiting restriction policy, relatives were discouraged to visit the patients unless they had a strong need. They had to seek the agreement from the ward manager or nursing office in-charge and they would be informed of the situation in ward 8A. Only one relative for each patient was allowed at a time. The visitors were given surgical masks. They were asked not to contact patients and not to feed. If contact was necessary, they had to wear gown and gloves. The nurses were asked to monitor the situation in the ward and ensure compliance. According to our record, no visitor got the infection after we introduced the precautionary measures on 10 March.

12. We closed ward 8A immediately around noon on 10 March to assess the situation. In the evening, the situation was re-assessed by the Chief of Service, the consultant microbiologist and the hospital management. Policy on patient discharge was discussed. We were concerned that keeping the patients who had recovered from their original illness continuously in the ward would expose them to a high risk of getting the infection. The microbiologist also advised that putting contacts on surveillance would be appropriate for influenza-like illnesses. There were ten patients who were noted to be recovering from their own illnesses (not pneumonia) and were ready to discharge. They were assessed by the clinicians to be medically fit and were not suffering or suspected to be suffering from atypical pneumonia. The policy was again reviewed and discussed in the meetings on 11 and 12 March. The recommendation from the Infection Control Team remained the same. On 12 March, we also deliberated that we had no right to keep the patients once they became medically fit; the quarantine authority had to be imposed in order for that to happen. The ten patients were discharged between 11 and 13 March and to be put under

surveillance by the DH. We advised the patients to return to the AED immediately if they had any fever or respiratory symptom and how they should keep their personal hygiene at home. These decisions were made in the outbreak management meetings involving the hospital management, clinicians from the Department of Medicine and the Infection Control Team. Dr. Au Tak Kong was also present in the meetings on 11 and 12 March, and expressed no disagreement. Dr. Au was invited to our meetings to provide public health advice and input to contain the spread of the infection. We did not consult HAHO, HA Board and HWFB before making the decision. After the discharge of these initial ten patients, the remaining patients in ward 8A were diagnosed to be suffering or suspected to be suffering from atypical pneumonia. These patients were kept in the hospital under cohort until they were fully treated and recovered by the end of March.

13. Out of the ten patients that were discharged between 11 and 13 March, four of them were subsequently re-admitted with symptoms and diagnosed to have SARS. The other six were free of SARS. The four subsequently diagnosed SARS patients did not cause any secondary infection while they were staying at home.

14. The Disease Control Center (DCC) was set up on 12 March. The Center was set up to (a) provide accurate statistics of the patients admitted for atypical pneumonia; (b) collect the demographic data of the admitted patients; (c) identify the likely source of infection; (d) monitor the clinical course and outcome of the patients; (e) provide a database to facilitate contact tracing; and (f) serve as the channel of communication internally with various clinical departments and externally with HAHO and DH. In the DCC, we documented the contact history of the patients and provided the data to support the Infection Control Team in conducting outbreak investigation and DH colleagues to conduct the epidemiological investigation. Based on the initial understanding with DH, they would be responsible for tracing the contacts in the community, and that included the discharged patients and the visitors, while PWH would be responsible for tracing the contacts of our own staff and medical students. DCC staff was therefore not involved in contact tracing in the community.

DH colleagues were invited to station in the DCC from 13 March onwards until 31 March in order to facilitate direct communication. In the morning, staff at the DCC would pass the information to the DH colleagues regarding the newly

admitted cases of atypical pneumonia or SARS. DH colleagues would then go up to the ward and interview these patients and complete a questionnaire for epidemiological investigation. The questionnaire included information regarding the likely source of contact and family members of the patient. A copy of the questionnaire would then be passed to the Center, where the PWH staff would enter the patient data into a database. The database was passed to DH staff on a daily basis. After 31 March, all newly admitted patients were interviewed by PWH's own staff in the DCC and a questionnaire would be completed. This questionnaire was slightly modified from the previous one used by DH. All completed questionnaires were faxed to the DH NTE Regional Office. Relevant information was also entered into the e-SARS system, which could be accessed by DH staff as well. The contact tracing procedures were essentially the same except that DH would be responsible for issuing the quarantine order to the patient contacts.

As contact tracing in the community was carried out by DH, we did not get in touch with the ward 8A visitors ourselves at the DCC. However, we had the record of contact history of all patients admitted to PWH and the NTEC hospitals. We were therefore able to find out that no visitor got infected after 10 March when precautionary measures were introduced.

15. The "step-down" ward arrangement was set up on 29 March in PWH. Prior to that, certain wards in the hospital were also called "step-down" but they were actually infection triage wards that serve to admit patients with uncertain diagnosis after initial screening in the fever screening ward 8D. The actual "step-down" arrangement only started in late March when we opened ward 11B on 29 March. The ward was opened as the clinicians identified that there were certain patients who were initially diagnosed or suspected to have SARS but were later on noted to have a different diagnosis or considered clinically to be not suffering from SARS. As they had been admitted to wards with SARS patients, it was considered unsafe to discharge them directly back to the community. When the need was identified by the clinicians, Professor Joseph Sung suggested the step-down ward arrangement in one of the Cluster Meetings on Atypical Pneumonia, which was endorsed. We were only able to identify the need for step-down arrangements in late March as we had more knowledge about the incubation period and the clinical presentation of the patients. It was then noted that the presentation in some elderly patients could be vague and clinicians might find it difficult to establish the diagnosis. Patients suffering

from SARS were kept isolated until the end of March when all of them had completed their treatment for SARS and were considered non-infective. Hence, there was no need for them to further go through the step-down arrangement.

16. Right from the beginning, patients originally staying in ward 8A were cohorted for isolation. Those who had the infection were cohorted in the rear cubicles while those diagnosed to be clear of the disease were cohorted in the front cubicles. After the discharge of the latter patients on 13 March, the whole ward was used as a cohort ward for admission of patients with atypical pneumonia and contact history. The cohorting arrangements of various medical wards were organized by Professor Joseph Sung as the Chief of Service (COS) in Medicine and endorsed in the hospital management meeting on atypical pneumonia. It was considered appropriate to turn the whole 8A ward into an atypical pneumonia cohort ward on 13 March as all the patients who stayed in the ward at that time were suffering from disease of the same nature. We did not admit any new non-SARS patient to ward 8A. In fact, from 13 March onwards, we had already made arrangements to divert all non-SARS emergency medical admissions to the Alice Ho Miu Ling Nethersole Hospital (AHNH) and North District Hospital (NDH). Only patients diagnosed or suspected to have atypical pneumonia or SARS would be admitted to PWH.

17. On 12 March, Professor Joseph Sung divided the Department of Medicine into a "clean team" and a "dirty team". We also started to cohort patients in ward 8A and established various cohort wards. Ward 8D was used as the initial infection triage ward to screen all fever patients requiring admission. Patients were separated into cases of suspected or probable SARS. Wards 8AB and 10AB were used as cohort wards for patients with SARS or probable SARS. Wards 10CD were opened as the "step-down infection triage" wards on 15 March to admit patients whom the clinicians were uncertain about the diagnosis after initial screening in ward 8D. On 29 March, 11B was opened as the "step-down" ward to receive patients transferred from the SARS cohort wards. All these wards were treated as high risk areas and staffs were required to put on full personal protective equipment for protection. They were also briefed and updated on infection control practices. For the medical teams, the "clean team" and "dirty team" members were not allowed to cross over in their clinical duties. The medical specialist outpatient clinics were only manned by the "clean team" doctors and their activities were reduced to provide medication re-fill only due to manpower constraints. We monitored the infection control situation

everyday in the cluster meeting on atypical pneumonia. These segregation and cohorting measures were considered effective as there was no evidence of infection arising from crossing over of clinical teams and patients.

18. HA announced the use of nebulizer was the probable cause of the spread of infection in ward 8A on 18 March after the combined meeting of the Central Committee on Infection Control and Expert Group on Severe CAP. It was our respiratory physician who first pointed out the use of nebulizer could be the main reason behind the extensive spread of the infection on 17 March. Dr SF Lui studied into the epidemiological evidence and provided the support for the hypothesis. The PWH management immediately informed the Head Office and stopped the use of nebulizer in the hospital.

19. We first suspected the index patient to be the source of infection on 13 March through aggregation of the contact history of the infected staff members and subsequent admission of the family members of the index patient on the same day. Professor Paul Chan from the Department of Microbiology did the time line analysis of the admitted patients and pinned down the index patient on 14 March. Such information was passed on to DH immediately through colleagues in the DCC. Our evidence was reviewed by the DH colleagues who subsequently confirmed the index patient to be the source of infection on the same day. CE/HA was informed of the progress on the identification of the index patient through my direct communication with him. I also talked to Dr Margaret Chan directly over the telephone on the identification of the suspected index patient; we agreed that the identification of the index patient would require DH confirmation before announcement.

20. There were 44 healthcare workers infected between the admission of the PWH index patient on 4 March and the time when he was identified to be the cause of infection on 13 March. When we first confirmed the occurrence of the outbreak on 11 March with the admission of 23 of our staff members, we started the epidemiological investigation in association with DH to find out the cause of the infection. On 12 March, we were able to identify three probable index patients around the corner of the cubicle where the index patient was staying. After identifying and confirming the index case on 13 and 14 March respectively, we tried to find out the reason behind the widespread infection, which apparently was too extensive for an infection caused by droplet spread. It was then noted that the pattern of medical students being infected seemed to correlate with the

date and time of use of nebulizer for the index patient in the ward; so were the discharged patients. We considered that the use of nebulizer was the cause of the extensive spread of the infection in the ward.

21. PWH closed its Accident & Emergency Department (AED) from midnight of 19 March. The closure lasted until 3 April. Healthcare workers in AED got infected through their exposure to the index patient during his two visits to the department on 28 February and 4 March. After 11 March, the AED was categorized as high risk area and staffs were asked to take infection control measures. The decision to close the PWH AED was made by the CE/HA in the cluster meeting on atypical pneumonia at noon time on 18 March. The decision was made having regard to the number of patients already admitted in PWH and the evidence of increasing demand on ICU. As at 18 March, PWH had already admitted a total of 104 SARS patients with 16 of them requiring intensive care. As a result of the closure of the AED, the non-medical emergency admissions (mainly surgical emergencies) also had to be diverted to other hospitals both inside and outside the cluster. Since we were also stopping the elective surgeries and admissions, it was considered that the surgical and anesthetic teams in other hospitals should have the capacity to take up the trauma and other emergencies from PWH. Special arrangements had to be made for the burns and neurosurgical patients to be transferred directly to the Queen Elizabeth Hospital and/or Kwong Wah hospital for treatment.

22. The issue of closing the PWH was first raised in the morning outbreak management meeting on 12 March in the hospital. I could not remember exactly who mentioned that. It was however also discussed that the closure of the entire hospital required quarantine authority which we did not have. The closure of the PWH AED and specialist outpatient (SOP) services was raised instead. As that decision would impact on other hospitals, we noted that it would require HAHO endorsement. In the outbreak management meeting held in the evening of 12 March, Dr. Ko Wing Man from HAHO was attending on behalf of CE/HA. The issue of closing the AED and SOP services was raised with a view to (a) limit the number of new patients that might be exposed to the infection; (b) reduce the workload burden on the hospital as there were many healthcare workers becoming sick with the disease; and (c) provide the capacity for the hospital to admit patients who had got the infection. The meeting considered that there was not enough data to support the need for the immediate closure of the entire AED service and the impact on other hospitals had to be carefully assessed. It was

agreed that PWH should divert all the non-atypical pneumonia medical emergency admissions to the other two acute hospitals in the cluster, i.e. AHNH and NDH; elective surgery would be stopped for a week to conserve the ICU capacity; SOP clinics normally attended by the team of physicians who got quite a number infected would be closed. Patients diagnosed or suspected to have atypical pneumonia would continue to be admitted to PWH. I had a subsequent telephone conversation with Dr. Margaret Chan during which I briefed her on the development in PWH, I mentioned that the issue of hospital closure had been raised. She told me that it would be a major decision and such decision should only be made at the highest level.

23. We kept the Head Office informed of the development of the outbreak in PWH since its outset. We set up our intranet website on atypical pneumonia and put up a daily situation report from 14 March onwards. The site was accessible by the Head Office. I was in contact with CE/HA and Dr. Ko Wing Man almost daily and informed them of the development before the special meeting involving all the Cluster Chief Executives in the evening of 15 March and the daily morning directorate meeting that started on 17 March. CE/HA visited PWH for a total of eight times before he was hospitalized on 23 March. During his visits, he had meetings with the hospital management, faculty members of CUHK and examined the progress of the epidemiological investigation. Colleagues from the DH NTE Regional Office were invited to our outbreak management meetings from 11 March onwards. As regards the reporting to the Working Group on Severe CAP, please refer to the answer to Question 8.

24. According to our records, there were a total of 114 healthcare workers, 17 medical students, 39 patients and 42 visitors infected in PWH during the SARS outbreak. Among them, 50 healthcare workers, 17 medical students, 28 patients and 42 visitors were infected directly in the ward 8A outbreak. Except for the initial batch of 42 visitors who got infected in ward 8A in the early days of the outbreak before 10 March, there were no more visitors among the patients.

For those who acquired the infection within the hospital, apart from the very first batch of 163 patients who contracted the disease through direct or indirect contact with the PWH index patient, we could broadly categorize the reasons behind the other infections under three periods. The first period was in March after the admission of the first batch of patients; the affected persons were mainly healthcare workers. The main reasons for the infection were

overcrowding in the designated SARS ward (the A&E Observation Ward), inadequate ventilation in the ward, the use of nebulizer in the A&E Observation Ward before 18 March, urgent deployment of some staff resulting in less than satisfactory preparation, and refusal by some patients to comply with the requirement of wearing masks in wards.

The second period was in April. There were both healthcare workers and hospital inpatients getting the infection. Infection mainly took place in the SARS and sep-down wards. We started to notice some patients with atypical presentations and healthcare workers being infected while taking care of some uncooperative elderly patients. At one time, some of our colleagues thought that it was due to inadequate protection by the personal protective equipments and requested the try of barrier-man. It turned out that barrierman actually caused more infection under Hong Kong's humid and hot environment. The use of barrierman was eventually dropped.

The third period started in May and lasted until the end of the outbreak. Infection mainly arose from the general medical or non-SARS related wards. We noticed that during this period, the percentage of highly dependent elderly patients increased to around 70% in these general medical wards. They required very intensive personal care which included care for their dementia, double incontinence, personal hygiene and feeding. Breakthrough infections and cross infections occurred due to slippage in infection control practices, mostly hand washing, as nurses and healthcare assistants provided care for these patients during their long 8 hour shifts.

25. As soon as we realized there was an unusual occurrence of infection among our own colleagues in ward 8A, we introduced a series of upgraded protective measures for our staff and patients. Upgraded droplet precautions (droplet and contact precautions) were introduced to ward 8A and subsequent to all high risk areas that involved the handling of atypical pneumonia patients. The interim guidelines introduced between 12 and 15 March in PWH and NTEC included those on droplet precautions; contact precautions; use of masks, N95, gloves, gowns; hand washing; handling of linen and clinical wastes, urinal, bed pans, and patient care equipment; environmental cleansing; advice to visitors; and management of patients with symptoms. Most of these guidelines were subsequently adopted by HAHO to become the corporate guidelines for all hospitals.

We promulgated these guidelines through our special intranet website on atypical pneumonia, the education/ training sessions on infection control, staff forums, and briefing to the frontline units by the infection control nurses. Our education sessions in infection control in PWH started on 13 March. The contents included features of atypical pneumonia, infection control precautions, use of personal protective equipments, work process re-design, disposal of potentially infected items, waste and specimen handling, environmental disinfection, and handling of visitors and dead bodies. During the SARS outbreak, a total of 183 education/ training sessions had been held in PWH by the Infection Control Team with 7,691 documented attendees.

In addition to all these, we merged our cluster risk management teams and the cluster infection control teams on 27 March to form the NTEC SARS Prevention Task Force. Under the Task Force, we organized the Infection Control Enforcement Network which involved the appointment of infection control coordinators down to the ward/ unit level. They were to supervise infection control practices at work place, perform infection control briefings and updates, serve as a buddy system to ensure good practices among staff, and liaise with the hospital and departmental infection control coordinators.

26. The source of the SARS outbreak in PWH came from the community. At PWH, we would consider it as part of a territory-wide outbreak. When PWH was affected, the spread and infectivity of the virus was amplified through the high concentration of patients and healthcare workers and a mix of environmental factors like overcrowding, insufficient ventilation system, lack of isolation facilities, and in particular in the ward 8A outbreak, the use of nebulizer. In PWH, the outbreak started in an unsuspected patient, which was different in the case of other hospitals, like Queen Mary Hospital and Kwong Wah Hospital where they were aware of the conditions or probable diagnosis of patients when the patients were admitted. The use of nebulizer, which aerosolized the droplets and turned the mode of transmission of the virus from droplet spread to air-borne like spread, was considered to be the main reason behind the extensive spread of the disease in ward 8A. From my communication with the clinicians, nebulizer had never been reported as the spreader of infections before. As regards the environmental factors, overcrowding in the wards of PWH had been a perennial problem due to its tight bed capacity. In terms of acute bed provision, NTEC had 1.97 beds per 1,000 population as against the Hong Kong

overall average of 2.36 beds per 1,000 population. The physical design of PWH was an outdated one with crowded space in the wards, inadequate circulation areas, outdated ventilation systems and lack of isolation facilities. Such physical constraints led to difficulties even in setting up proper gown-up and gown-down areas for personal protective equipments in the wards.

27. The diversion of the non-atypical pneumonia/SARS emergency medical patients from PWH to AHNH and NDH was a group decision made in the outbreak management meeting in the evening of 12 March. In our assessment, AHNH and NHD should have the capacity in admitting such patients after we stopped the elective admissions. Our intention was also to keep the two hospitals "clean" while admitting all atypical pneumonia or SARS patients to PWH. In our assessment, steps could be taken to prepare AHNH for the increased workload. Admission of non-emergency medical patients in AHNH would be stopped to enhance its capacity to take up more emergency cases. Other hospitals outside NTEC would assist in taking up cases. These hospitals included Princess Margaret Hospital, Caritas Medical Center and Queen Elizabeth Hospital.

    To prepare AHNH for the increased workload, the hospital management (a) stepped up the infection control measures in the hospital according to the prevailing infection control guidelines in NTEC; (b) organized primary diversion of all trauma cases without life-threatening conditions to the NDH AED; (c) organized secondary diversion of general cases to hospitals in other clusters when AHNH became full; (d) enhanced the AED service capacity by suspending the observation ward and follow-up service, stationing a phlebotomist in the department and providing 24 hour blood tests and CT service; (e) enhanced the overflow arrangement of medical patients to non-medical wards; (f) enhanced the convalescent support by Tai Po Hospital; (g) stopped all elective admissions and surgeries; (h) provided additional training to staff on infection control measures; (i) arranged wards E1 and F1 to admit all non-atypical pneumonia/ SARS respiratory patients; and (j) set up staff communication and support mechanisms.

28. The total number of patient transferred from PWH AED (without going through AHNH AED) in March was 73. None of them had SARS on the discharge diagnosis. Transfer was virtually stopped after the outbreak in E1 of AHNH on 31 March.

The number of ambulance cases transported directly to AHNH increased from an average of 48 per day in February to an average 115 per day in the last two weeks of March after the closure of the PWH AED.

The agreed arrangement was that only the non-SARS medical emergency patients would be diverted to AHNH. All patients suspected or diagnosed to have atypical pneumonia or SARS would be admitted to PWH or the Princess Margaret Hospital (PMH). Patients were triaged at the AHNH AED according to the following:

(a) All suspected SARS patients would be referred to PWH or later on PMH if the patient had the history of contact, fever >38C, abnormal CXR and lymphocyte count <1.0;
(b) Patients with respiratory illness but not meeting the above criteria, especially those with history of contact, would be admitted to AHNH E1 and F1 wards where there were a few isolation rooms;
(c) Other patients would be admitted to their respective specialties as necessary;
(d) Patients could be referred to GOPD for follow-up, or re-attend A&E as appropriate; and
(e) Senior Medical Officers of the AHNH AED would be responsible for case triage and patients would be segregated into fever and non-fever zones.

29 According to the information provided by AHNH, the hospital was able to identify 15 patients who acquired SARS outside the hospital before admission. They had no contact history with ward 8A of PWH. Eight of these fifteen could be the "index patients" that caused outbreak in different wards of AHNH.

The index patient that could have accounted for the outbreak in the first affected ward E1 was admitted on 21 March with fever since 15 March. It was noted that the patient had no travel history to the Mainland, nor any history of visit to PWH. There was no contact history with SARS patients. A specialist in respiratory medicine had assessed the patient and considered that the patient was suffering from bacterial pneumonia. Antibiotics treatment was started. The patient's condition was stable after admission. SARS was suspected when the patient did not respond to antibiotics for 3 days. Healthcare workers were having surgical masks and practicing droplet precautions. The patient was placed in the far end corner of a cubicle while waiting for isolation room. The

patient was asked to wear a mask but was not cooperative. There were 9 healthcare workers infected as a result of nursing the patient. The patient was later transferred to PMH when diagnostic criteria for SARS was fulfilled and accepted by PMH.

30. The decision to close E1 to admission, discharge and visitors was initiated by Chief of Service in Medicine on 31 March, and was endorsed by HCE on the same day, when three nurses were admitted to PMH that day. It was decided to have an infection triage ward in the hospital. On 3 April, it was agreed by the Deputizing CCE, AHNH and TPH to cleanse the ward after transferring the remaining patients to Tai Po Hospital and re-open it as the infection triage ward. The ward was subsequently re-opened on 7 April.

31. The first SARS ward F1 in AHNH was opened on 14 April. The decision was made by the Deputizing CCE together with members of the Cluster Meeting on Atypical Pneumonia. It was considered that given the rate of SARS infection of healthcare workers and patients in AHNH, the opening of a SARS ward in AHNH became necessary as (a) the SARS wards in PWH were full; (b) there was a lack of nursing staff in PWH to open additional SARS wards; and (c) it was more desirable to keep the AHNH staff to continue their work in the hospital instead of relocating to PWH.

32. The suggestion was initiated by the hospital management in consultation with Dr SF Lui as the Chairman of the NTEC SARS Prevention Task Force on 1 April. The Deputizing CCE endorsed the suggestion on 3 April. TPH had all along been providing convalescent support to AHNH. The transfer of patients for convalescence and quarantine was a new arrangement with no pre-existing policy. The basis of decision at that juncture was (a) the need to continue to cohort the remaining patients in ward E1; and (b) the need to maintain service capacity in AHNH for admitting new patients, especially for the purpose of infection triage. The hospital management had considered the following in making the transfer: (a) the need to inform and prepare TPH for taking over the E1 patients; (b) the caution against mixing the cohort group with other patients; (c) the infection control measures in the course of transfer; and (d) the risk of spread of SARS to TPH. It was noted that the occupancy of AHNH medical wards remained high during the period (103.9% on 1 April). There was a definite need to provide medical beds for new patients with fever or suspected SARS in the heat of the epidemic.

In TPH, infection control precautions had been enforced since the outbreak of atypical pneumonia in PWH in mid-March. Cohorting of suspected contacts and isolation of patients with suspicious symptoms were practiced. A series of structured infection control training had also been started since 21 March. Environmental improvement work had been done, including the increase in fresh air intake and air change rate. All medical wards were regarded as high risk wards since 31 March. Visitors control had been tight. Staff communication had been enhanced, and staff health surveillance had been implemented. In short, the TPH had the necessary vigilance and preparedness to take care of the cohort patients in early April.

TPH was notified of the transfer plan on 1 April and again at a meeting on 3 April. The cohort ward was upgraded to ultra-high risk for infection control purpose. Appropriate infection control measures were taken during transportation of the patients.

33. Fourteen patients were transferred from E1 of AHNH to ward 3AR of TPH in one batch on 3 April for convalescence and continued quarantine. Their conditions upon transfer to TPH were stable, afebrile, with no signs or symptoms suspicious of SARS. The patients were cohorted in the same ward for observation of signs and symptoms of SARS. Their temperature and respiratory symptoms and signs were monitored. Chest x-ray and blood tests were checked if indicated. The cohort ward was regarded as ultra high risk, with appropriate personal protective equipment provided for staff, and visiting was prohibited. None of this list of 14 patients had clinically suspicious symptoms on discharge or transfer out of the ward, which was closed on 15 April (for preparation of opening of the SARS ward in TPH on 21 April), twelve days after moving over to TPH. Of these 14 patients, 2 of them were transferred to ward 4BR on 15 April for continued medical treatment as they were not fit for discharge. Both of them were later cross-infected during their stay in 4BR. The both developed suspicious symptoms on 25 April.

34. The "Meeting on Atypical Pneumonia" was first organized on 13 March. Its terms of reference were (a) to monitor development of the outbreak; (b) to disseminate information; (c) to provide direction in the handling of the outbreak; (d) to coordinate operational issues; and (e) to provide feedback. I chaired these meetings as the HCE and its membership included all Chiefs of

Services (COSs), the cluster Service Director in Medicine and A&E services, Dean of Faculty of Medicine of CUHK, Coordinators in Clinical Services, General Manager (Nursing), General Manager (Administrative Services), Head of the Infection Control Team, coordinator of the DCC, and Chairman of the PWH Doctors' Association. The meeting was formalized to become the "Cluster Meeting on Atypical Pneumonia" on 17 March with the involvement of other HCEs in the cluster who also served as directors for various cluster services. The COSs and the general managers in PWH all have cluster coordination roles at the same time. On my return to work on 28 April after recovered from SARS, I further strengthened the committee to involve other cluster coordinators in clinical services who were not already COSs in PWH and re-named the committee as the "Cluster SARS Meeting". There was no change to its terms of reference. In these meetings, we would go through the patient statistics, clinical progress of the patients, development of clinical management strategies, progress of epidemiological investigations, development of microbiological and laboratory investigations, results of breakthrough infection investigations, infection control guidelines and measures, operational contingency arrangements, procurement and supplies status, staff support arrangements and feedbacks from hospitals. We would also cover the key messages coming from the Daily SARS Round-up meetings in HAHO. Key decisions made in these meetings were mainly related to operational and staff support issues.

35. CE/HA chaired a directorate meeting every day at the Head Office since 17 March. On 24 March, the meeting was expanded to become the "Daily SARS Round-up Meeting". Its purpose was the same as those of the "Cluster SARS Meetings". The meeting was chaired by Dr. Ko Wing Man who was then the Deputizing CE. Members of the meeting included all the CCEs, and the deputy directors, senior executive managers/ executive managers/ senior managers at HAHO. The Chairman of HA also attended these meetings. CE/HA resumed duty on 30 April and took up the chairmanship of the meeting from the date onwards. The meeting discussed and made decisions on all aspects related to the handling of SARS, including patient statistics, clinical management, infection control and personal protective equipment standards, operational contingency arrangements, human resources policies, IT development, procurement and supplies, as well as public affairs and internal communication strategies.

36. The "NTEC SARS Prevention Task Force" was set up on 27 March with the merging of the cluster risk management and cluster infection control teams. At

the second week of the PWH outbreak, we started to notice some breakthrough infections among healthcare workers who were supposed to be protected with personal protective equipments and well briefed on infection control practices. When we analyzed the cause of these breakthrough infections, the reasons included overcrowding in the designated SARS ward (the A&E Observation Ward), inadequate ventilation in the ward, the use of nebulizer in the A&E Observation Ward before 18 March, urgent deployment of some staff resulting in less than satisfactory preparation, and refusal by some patients to comply with the requirement of wearing masks in wards. We considered it important to beef up our infection control measures. The Task Force was chaired by Dr, SF Lui who was the Service Director in Risk Management & Quality Assurance for NTEC. Its purpose was to prevent secondary infection of SARS among healthcare workers and patients. Its work included: (a) to assess staff knowledge on infection control; (b) to organize the infection control enforcement network down to the frontline work units; (c) to develop infection control programs to reduce secondary infection; (d) to conduct risk scanning on ward environments; (e) to standardize protocols and practices in infection control measures; (f) to conduct audit and ensure compliance in infection control practices; and (g) to promulgate guidelines and communicate with staff on infection control measures. The Task Force members included members of the cluster risk management and the cluster infection control teams.

37. I was first admitted in the evening of 27 March and was finally discharged from the hospital on 16 April. I formally returned to work on 28 April. For the whole month during my absence, Dr. Philip LI, Deputy Hospital Chief Executive in PWH, was appointed as the Deputizing Cluster Chief Executive for NTEC and Hospital Chief Executive for PWH. The deputizing arrangement was endorsed by the Chairman and Deputizing CE of HA. The Hospital Governing Committee of PWH was notified. While I was in hospital, I was not involved in making decisions on matters related to PWH and NTEC though Dr. Philip Li did update me on the progress of matters almost on a daily basis (except for the few days when my condition was unsatisfactory). He would seek my advice and comments on certain difficult issues like the re-opening of the PWH AED. Professors Sydney Chung and Joseph Sung also visited me in the ward almost daily and discussed matters with me when my condition was good.