

Chapter 6 Outbreak at the Prince of Wales Hospital

Finding of facts

6.1 “There were 11 healthcare workers (HCWs) of Ward 8A reporting sick with respiratory tract infection symptoms over the last few days”, the Department Operations Manager (DOM) of the Department of Medicine and Therapeutics in the Prince of Wales Hospital (PWH), Mr Albert NG Hon-yui, told the Chief of Service of the Department, Professor Joseph SUNG Jao-yiu, in the morning of 10 March 2003.

6.2 Professor SUNG immediately called an urgent meeting of the senior staff in the Department at noon to review the situation.

6.3 PWH is the teaching hospital of the Faculty of Medicine (the Faculty) of The Chinese University of Hong Kong (CUHK). The outbreak in Ward 8A in PWH, which was later found to be caused by a novel virus, marked the beginning of a severe epidemic in Hong Kong. On 15 March 2003, the World Health Organization (WHO) named the novel virus “Severe Acute Respiratory Syndrome” or SARS. The SARS attack on PWH was so rapid and severe that a total of 114 HCWs, 17 medical students, 39 patients and 42 visitors were infected. Among them, 50 HCWs, 17 medical students, 28 patients and 42 visitors were infected in Ward 8A.

6.4 This Chapter focuses on the initial stage of the outbreak at PWH covering the period from 10 March to 28 March 2003, when the number of admissions of atypical pneumonia (AP)/SARS patients was at its peak. A chronology of the important events and activities during the SARS outbreak at PWH is set out in Appendix VI.

Admission of the index patient of the Prince of Wales Hospital, JJ

6.5 *JJ*, who was later identified as the index patient who caused the SARS outbreak at PWH, was a 26 year-old man. He developed a fever on 24 February 2003 and sought treatment in the Accident and Emergency

Department (AED) in PWH on 28 February 2003. He was diagnosed to have upper respiratory tract infection, given treatment and sent home. He returned to AED on 4 March 2003 and was admitted to Ward 8A with a diagnosis of Community-Acquired Pneumonia. After being treated with antibiotics he showed signs of slow improvement. On 6 March 2003, his attending physician decided to give him bronchodilators through a nebulizer to facilitate sputum production. His condition started to improve and he became afebrile on 11 March 2003. During his stay in Ward 8A, he did not require assisted ventilation or admission to the Intensive Care Unit (ICU). His travel history did not indicate any recent travel to the Mainland. As his condition did not satisfy the criteria of Severe Community-Acquired Pneumonia (SCAP), HCWs attending to him did not take any infection control measures. It was later found out that he had infected three doctors and three nurses during his two visits to AED.

The outbreak

6.6 On 10 March 2003, the number of HCWs from Ward 8A who reported sick was 11. On being notified of this large number of HCWs feeling unwell at the same time, the Infection Control Team (ICT) in PWH, headed by the Infection Control Officer (ICO), Dr Donald James LYON, visited the Ward. Dr LYON was also the Consultant in microbiology. On the basis of the information gathered from the patients, ICT got the initial impression that the HCWs concerned were suffering from a flu-like disease. Dr LYON advised HCWs in Ward 8A to take additional precautions when working in the Ward.

6.7 The urgent meeting called at noon by Professor SUNG was attended by the senior management staff in PWH, clinicians of the Department of Medicine and Therapeutics and members of ICT. The following decisions were made -

- (a) Ward 8A would be temporarily closed to admission, discharge and visiting starting from the afternoon of 10 March 2003;

- (b) infection control measures would be upgraded, i.e. wearing of gowns and surgical masks by all HCWs;
- (c) HCWs and medical students who might be sick but who had not so reported to the Hospital would be traced;
- (d) patients who were discharged from Ward 8A in the previous seven days would be traced; and
- (e) the hospital administration including the Hospital Chief Executive (HCE), Dr FUNG Hong, the Deputy Hospital Chief Executive, Dr Philip LI Kam-tao, and the Service Director (Risk Management and Quality Assurance) of the New Territories East Cluster (NTEC), Dr LUI Siu-fai, would be informed of the situation in PWH.

6.8 According to Professor SUNG, there was no consultation with the Head Office of the Hospital Authority (HAHO) or the Health, Welfare and Food Bureau (HWFB) before the above decisions were made. Dr FUNG, who was also the Cluster Chief Executive (CCE) of NTEC, endorsed the decisions after being informed of them.

6.9 Dr LYON notified HAHO of the outbreak at PWH on 10 March 2003. While Dr LYON recalled that he had a number of telephone conversations with the staff of the New Territories East Regional Office (NTERO) of the Department of Health (DH) on the first couple of days of the outbreak, he could not remember exactly when he first informed DH of the outbreak.

6.10 The situation in Ward 8A was re-assessed at a meeting chaired by Dr Philip LI in the evening of 10 March 2003. One of the issues discussed was that HCWs in Ward 8A had received complaints from patients there and their family members about Ward 8A being closed to visiting. The meeting decided that restricted visiting be allowed for the patients' immediate family members. The change in policy from "no visiting" to "restricted visiting" was reported to and endorsed by Dr FUNG. At a meeting held in the following

morning and attended by the senior management staff in the Hospital, the clinicians of the Department of Medicine and Therapeutics, the members of ICT and members of the Faculty, the restricted visiting policy was confirmed. According to Mr Albert NG, there was no visitor to Ward 8A on 11 March 2003.

6.11 The Community Physician (New Territories East) of DH, Dr AU Tak-kwong, learnt of the large number of HCWs in PWH on sick leave through media reports on 11 March 2003. He immediately called Dr LI who confirmed the media reports. Later in the morning, at his own initiative, Dr AU joined a meeting at PWH chaired by Professor SUNG at which the outbreak in Ward 8A was discussed. According to Professor SUNG, the authority to impose quarantine measures was considered in this connection. There was the fear that if Ward 8A was closed, patients in the Ward would request to discharge themselves against medical advice and PWH had no right to stop them. The discharge of patients who might have been infected would pose a risk of spreading the infection to the community. On the other hand, the authority to quarantine healthy contacts or non-infected persons did not rest with the Hospital. Dr AU's recollection was that the meeting had commenced when he arrived and Professor SUNG summed up for him the position on PWH. He learnt that the decision to close Ward 8A to admission, discharge and visiting had already been implemented on 10 March 2003, and that the no visiting policy was relaxed in the evening of 10 March 2003 to avoid patients discharging themselves against medical advice. He was, therefore, not aware of the discussion on quarantine measures.

6.12 At the meeting, Dr AU undertook to conduct an epidemiological survey of HCWs who reported sick and to design a questionnaire for conducting a survey. The survey was essential for him to understand the cluster, work out the case definition for contact tracing and estimate the incubation period.

6.13 In the afternoon of 11 March 2003, as the number of HCWs in PWH who reported sick went up to 50, PWH set up an emergency medical clinic and called back all HCWs with fever for physical examination and screening. A total of 23 HCWs were admitted immediately after the examination.

6.14 Later in that day, Dr AU provided PWH with a questionnaire which was to be completed by HCWs who turned up for examination at the emergency medical clinic. In the evening, PWH sent a name list of 36 affected HCWs to NTERO which successfully interviewed 26 of them that night. Most of the HCWs were found to have symptoms of fever and chills. NTERO advised all of them to seek immediate medical treatment at the PWH emergency medical clinic. Advice on personal hygiene was also given. The data obtained in the interviews was analyzed for clinical and epidemiological features. On the following day, Dr AU presented the preliminary epidemiological findings to the senior management staff in PWH, the clinicians of the Department of Medicine and Therapeutics and the members of ICT. It was suspected that the probable modes of spread were droplets and fomites. The incubation period estimated at that time was from one to seven days. PWH and NTERO shared the survey findings on clinical features and agreed on a working case definition for “active case finding and surveillance”.

6.15 In the days that followed, the number of HCWs who came down with the disease continued to rise. The senior management staff in PWH held meetings twice a day to review the situation. The NTEC Meeting on Management of AP Incidence was formed on 13 March 2003. The Meeting served as the steering mechanism to handle the outbreak. It was to make decisions on strategies and policies on disease and infection control. Chaired by Dr FUNG, members of the Meeting included senior members of the cluster management, various Chiefs of Service and clinical heads, head of ICT of PWH and the Dean of the Faculty of Medicine of CUHK, Professor Sydney CHUNG Sheung-chee.

6.16 The Secretary for Health, Welfare and Food (SHWF), Dr YEOH Eng-kiong, first learnt about the outbreak at PWH through media reports on 11 March 2003. He was very concerned and immediately contacted the Director of Health (D of H), Dr Margaret CHAN FUNG Fu-chun, and the Chief Executive of the Hospital Authority (HA), Dr William HO Shiu-wei, for more information, as he considered it unusual for a group of HCWs from the same ward to become ill at the same time. He was told that NTERO and PWH were working together to investigate the outbreak, and that the Hospital was taking the necessary infection control measures. He also discussed with

Dr Margaret CHAN the arrangements for seeking external expert help from WHO.

6.17 On 12 March 2003, DH advised WHO of the large-scale outbreak at PWH. WHO issued a global alert on that day (Geneva time) about cases of acute respiratory syndrome in Vietnam, Hong Kong and Guangdong with unknown aetiology that appeared to place HCWs at high risks.

6.18 On 13 March 2003, Dr YEOH convened and chaired a meeting which was attended by a senior expert from the Centers for Disease Control and Prevention (CDC) in Atlanta, the United States of America, a representative of WHO, local experts in the field, as well as health officials and executives, including Dr Margaret CHAN; the Deputy D of H, Dr LEUNG Pak-yin; Dr William HO; the Director (Professional Services and Public Affairs) of HA, Dr KO Wing-man; and Dr FUNG Hong. According to the expert members, the actions taken by PWH and DH were appropriate. The meeting arrived at a series of key decisions in respect of inter-agency collaboration and communications, as well as the division of labour on the management of the outbreak. It was also agreed that Dr YEOH would chair a steering group to coordinate efforts to control the outbreak and to enhance information exchange, while Dr LEUNG Pak-yin would chair an expert group with experts from DH, HA, WHO, the University of Hong Kong and CUHK to focus on the investigation into the outbreak. The two groups were merged to become the HWFB Task Force on 14 March 2003. HA representatives also attended these meetings.

6.19 On 14 March 2003, the Chief Executive of the Hong Kong Special Administrative Region and Dr YEOH visited PWH to meet with the frontline HCWs and to keep abreast of the outbreak situation. The Hospital management provided them with an update on the outbreak situation and its infection control measures. They also visited the Disease Control Centre (DCC) set up at the Hospital and observed that DH and PWH were working together in the investigation and management of the outbreak. On 20 March 2003, Dr YEOH visited PWH again to participate in a staff forum for a dialogue with the management and frontline HCWs on the outbreak situation.

Infection control measures introduced after the outbreak

Formation of the outbreak control team

6.20 ICT of PWH, led by Dr LYON and comprising a microbiologist and two Infection Control Nurses, was responsible for developing specific guidelines on the management of AP, recommending standards in personal protective equipment (PPE), providing staff training on infection control measures, and policing and auditing the infection control practices.

6.21 According to HA, each hospital formulates its own policy and procedures on handling an outbreak of infection which are updated and endorsed by the Hospital Infection Control Committee. When a major outbreak occurs in a hospital ward, it will necessitate the convening of an emergency outbreak control team. Team members will include HCE, ICO, the General Manager (Nursing), Ward Managers, DOM, physicians in charge of the cases, etc. Dr LYON told the Select Committee that immediately following the outbreak in Ward 8A, an initial outbreak control team drawing additional expertise from different departments was formed to investigate and control the outbreak. The membership included the clinicians in the Department of Medicine and Therapeutics, the members of ICT as well as senior medical and nursing staff. Either Dr LI or Professor SUNG chaired the meetings of the outbreak control team on the first two days of the outbreak before Dr FUNG took over on 12 March 2003.

Guidelines issued by the Head Office of the Hospital Authority on 12 March 2003

6.22 At the time of the PWH outbreak, the recommended infection control measures that should be taken when handling patients with AP or flu-like illness were droplet precautions, in addition to universal precautions. According to the guidelines issued by HAHO on 12 March 2003, droplet precautions included -

- “(a) place a patient in a room with other patient(s) having influenza (cohorting). Special air handling and ventilation

are not necessary. When cohorting is not possible, maintain separation of at least three feet from each other;

- (b) wear barrier apparels (gloves and gowns) when coming into contact with patient's blood, body fluids, secretions, excretions, mucous membranes and contaminated items;
- (c) wear a mask when working within three feet of the patient;
- (d) wash hands after removal of gloves and before nursing another patient; and
- (e) disinfect the environment and equipment properly”.

Infection control measures for healthcare workers

6.23 PWH reviewed the infection control measures daily at the outbreak control team meetings. Various sets of guidelines on infection control in various wards/areas, precautionary measures and management of patients with AP or recovering from it were issued between 13 March and 21 March 2003. The guidelines also included the standards in the provision of PPE for HCWs in NTEC. These guidelines and standards were modified and updated by Dr LYON in response to changing circumstances and the results of reviews and audits. The Select Committee noted from the information subsequently provided by Dr LYON that he had issued 13 NTEC guidelines from 14 March to 31 March 2003 (as set out in Appendix VII). They were all posted on NTEC intranet for easy access. Most of these guidelines were subsequently adopted by HAHO to become the guidelines for all the hospitals.

6.24 Starting from 13 March 2003, training sessions on infection control were organized for HCWs in PWH. These sessions were held at least twice weekly. Initially, these sessions focused on the basic infection control concepts and practices. Later on, the emphasis was shifted to correcting wrong practices.

6.25 All the witnesses from PWH told the Select Committee that there was sufficient supply of PPE during the outbreak. Dr FUNG explained to the Select Committee that as PWH was the only hospital experiencing a major outbreak in March 2003, the supply of PPE was not a problem. The supply of small size N95 masks for the whole of HA, however, was very tight at one stage. He also informed the Select Committee that in NTEC there were two warehouses for storing PPE. There was a PPE coordinator in each hospital to liaise with the warehouses and the wards to ensure sufficient provision of PPE for HCWs.

Infection control measures in the affected wards

6.26 Having regard to the highly infectious nature of the disease which was pending investigation, Ward 8A was temporarily closed to admission, discharge and visiting in the afternoon of 10 March 2003. No patients were moved out of the Ward on that day. In accordance with the guidelines on droplet precautions, Dr LYON suggested that patients be cohorted in the Ward as follows. Patients clinically suspected to have been infected were put together in the rear cubicles of the Ward, while those who were not infected or believed not to have been infected were grouped together in the front cubicles of the Ward. According to Mr Albert NG and the Deputizing Nursing Officer of Ward 8A, Mr CHAN Man, such segregation might not have been effective in preventing cross-infection among the patients because both the patients and HCWs were not prohibited from moving between the front and the rear cubicles, not to mention the need to use the communal bathroom in the Ward.

6.27 On 11 March 2003, an emergency medical clinic was set up in PWH. A total of 50 HCWs were called back for physical check up. The Observation Ward in AED was opened to admit the first batch of 23 HCWs for isolation. For symptomatic HCWs who were not admitted, a screening clinic was set up in AED with two cohort rooms to monitor their conditions. AED was classified as a high risk area.

6.28 On 12 March 2003, HCWs in the Department of Medicine and Therapeutics were divided into a “Dirty Team” and a “Clean Team” to prevent cross-infection. They were not allowed to cross over in their clinical duties.

Cohorting of patients also started with Ward 8D being used as the initial triage ward to screen all feverish patients requiring admission. On 13 March 2003, Wards 8A and 8B were used as cohort wards for patients with AP or suspected to have contracted AP. The cohorting arrangements in the various medical wards were organized by Professor SUNG. Wards 10C and 10D were opened as the “step-down triage” wards on 15 March 2003 to admit patients who could not be diagnosed for certain after the initial screening in Ward 8D. On 18 March 2003, Wards 10A and 10B were also opened for cohorting patients with SARS or suspected to have contracted SARS.

6.29 According to HA’s Report of the Outbreak of SARS in Ward 8A in PWH submitted to the SARS Expert Committee, a total of eight wards, namely 8A, 8B, 8D, 10A, 10B, 10C, 10D and 11B, were used for cohorting suspected or confirmed SARS patients, by 18 March 2003. On 29 March 2003, Ward 11B was used as a “step-down” ward to receive patients transferred from the SARS cohort wards before they were discharged from PWH. All these Wards were classified as high risk areas and HCWs were required to put on full PPE for protection. On 28 March 2003, the number of patients admitted to PWH reached its peak of over 160 confirmed SARS cases.

Infection control measures for visitors

6.30 To prevent visitors to Ward 8A from being infected after the lifting of the no visiting policy in the evening of 10 March 2003, the following precautionary measures were implemented -

- (a) only immediate family members were allowed to make visits but even they were discouraged to do so unless they had a strong need;
- (b) only one relative for each patient was allowed at a time;
- (c) visitors had to take droplet precautions, including the wearing of surgical masks, gowns and gloves provided by the Hospital;

- (d) relatives were asked not to make physical contact with or feed the patients; and
- (e) nurses were asked to monitor the situation in the Ward and ensure compliance with the precautionary measures.

6.31 According to Dr FUNG, no visitor to Ward 8A was infected with AP or SARS after the introduction of these precautionary measures on 10 March 2003.

Review and audit

6.32 The experts on infection control from CDC in Atlanta were invited to review the infection control measures in PWH on 26 March 2003. Specific questions were raised by the senior management staff in PWH in relation to the restricted visiting policy, the need to carry out terminal disinfection in Ward 8A, and the infection control measures and practices promulgated since the onset of the outbreak. The experts considered that the infection control measures were up to international standards but there was a need to enforce implementation.

Discovery of the index patient, JJ

6.33 Following the admission of 23 HCWs, PWH started to investigate the outbreak in association with DH on 11 March 2003 with a view to finding out the cause of the infection. PWH noted that only HCWs in Ward 8A were infected while no abnormal pattern was observed among the patients in the Ward. An epidemiological survey conducted by DH in the same evening showed that some medical students and HCWs not from Ward 8A but having visited Ward 8A were infected. Further interviews of these medical students and non-Ward 8A HCWs on 12 March 2003 confirmed that they had no close contact with Ward 8A HCWs, but had gone to Ward 8A to attend to some selected patients. Both PWH and DH believed that one or more than one of the patients in Ward 8A were involved or might be the source of the infection.

6.34 Dr LYON explained to the Select Committee that it was difficult to identify the index patient of the outbreak at PWH because the illness was widespread and its presentation was relatively non-specific. The fact that the illness was mild made it difficult to determine at the early stage who had the disease and who did not have the disease. In addition, information gathered was pointing at different directions. Dr LYON also explained that, in the early days of the outbreak, efforts were devoted not just to identifying the index patient, but also to preventing the spread of the infection. He agreed that to some extent it might have been wrong to have diverted more resources to stopping the outbreak than to identifying the index patient.

6.35 According to Dr FUNG, three patients who were placed around the corner of the cubicle in Ward 8A where *JJ* was staying were considered probable index patients on 12 March 2003. By 13 March 2003, the leads gathered from the investigation had all suggested that *JJ* might be the index patient. According to Professor CHUNG, during an evening ward round, one of the infected HCWs told him that he suspected *JJ* to be the source of the infection. Dr FUNG said that aggregation of the contact history of the infected HCWs and subsequent admission of *JJ*'s family members on 13 March 2003 shed light on the source of the infection. According to Professor SUNG, *JJ* was put in an isolation room in Ward 8A on 13 March 2003. According to Dr AU Tak-kwong, however, when a nursing staff of DH interviewed *JJ* in the morning of 14 March, *JJ* was still in an open cubicle in Ward 8A. Professor Paul CHAN Kay-sheung from the Department of Microbiology did a time line analysis of the patients in PWH suspected to have been infected with AP and pinned down the index patient on 14 March 2003. Meanwhile on the same day, DH found, during the course of epidemiological investigation, the linkage between *JJ* and his four relatives who were admitted to PWH and the Baptist Hospital with fever on 13 March and 14 March 2003 respectively.

6.36 PWH and DH shared and discussed the findings of their respective investigations into the cause of the outbreak at PWH. The identification of *JJ* as the index patient of the PWH outbreak was confirmed and an announcement was made by Dr Margaret CHAN on 14 March 2003. PWH and DH agreed that there was a need to trace all the persons who had been exposed to *JJ* in his

cubicle, meaning those “exposed” HCWs, medical students, patients and visitors. It was also learnt from *JJ* on 19 March 2003, after repeated questioning, that he had visited an acquaintance at the M Hotel at about the time when the index patient of the SARS outbreak in Hong Kong, *AA*, was staying at the Hotel.

6.37 After the identification of *JJ* as the index patient, investigation into the reason behind the widespread infection continued. According to HA’s Report of the Outbreak of SARS in Ward 8A in PWH submitted to the SARS Expert Committee, all the medical students who visited Ward 8A after 10:40 am on 8 March 2003 and during the following day⁷ had been infected. The pattern of the medical students’ infection seemed to correlate with the date and time of the use of nebulizer for *JJ* in the Ward. It was postulated that the use of nebulizer was the cause of the extensive spread of infection in the Ward. HA announced the finding on 18 March 2003. The postulation, however, was disputed by Professor WONG Tze-wai⁸. Professor SUNG told the Select Committee that Ward 8A had already stopped using nebulizers from 12 March 2003.

Admission of index patient of the SARS outbreak at the Amoy Gardens, *YY*

*Admission, discharge and re-admission of *YY**

6.38 While there was no sign of the outbreak at PWH subsiding, a major outbreak was about to occur at the Amoy Gardens. *YY*, a patient in PWH, appeared to be the source of that outbreak. Dr William HO described the outbreak at the Amoy Gardens as “a tornado to the healthcare system, occurring with great rapidity”.

⁷ A few witnesses from PWH told the Select Committee that the date of visit was 6 March 2003, while Professor WONG Tze-wai said that the medical students visited Ward 8A on 6 March and 7 March 2003. Professor WONG also informed the Select Committee that not all the medical students were infected.

⁸ In a research paper of which Professor WONG was one of the authors, it was stated that no association was observed between the medical students’ stay in Ward 8A at the specific periods when the nebulizer was used and the development of SARS. The research paper entitled “Cluster of SARS among medical students exposed to single patient, Hong Kong” was published in a journal called “Emerging Infectious Disease” (Vol. 10, No. 2, February 2004). The co-authors are WONG T W, LEE C K, TAM W, LAU T F, YU T S, LUI S F, CHAN K S, LI Y, BRESEE J S, SUNG J Y and PARASHAR U D.

6.39 YY lived and worked in Shenzhen but travelled to Hong Kong weekly to receive haemodialysis in PWH. He was admitted to PWH on 15 March 2003, discharged on 19 March 2003 and re-admitted on 22 March 2003. The Select Committee noted that the case of YY during his first admission and re-admission was handled as follows. On 15 March 2003, YY presented himself to Ward 8C (renal unit) for routine haemodialysis. Upon his arrival, he did not show specific symptoms. He charted his own temperature as 37°C. During haemodialysis, he was unwell and his temperature was 38.6°C when checked by the nursing staff. When questioned, YY admitted that he had been having symptoms of cough, myalgia and arthralgia for one day. YY was initially managed as a possible bacterial and AP case. The Renal Consultant, Dr LUI Siu-fai, was notified and reviewed YY's condition.

6.40 In view of YY's clinical picture which was suggestive of AP and his travel history to Shenzhen, the Senior Medical Officer, Dr LEUNG Chi-bon and the Medical Officer, Dr CHAN Chio-ho of the "Dirty Team" on duty on 15 March 2003 were notified for consideration of admission of YY. The results of the preliminary investigations were available by then. YY's chest X-ray showed right lower zone infiltrate.

6.41 YY's case was further discussed among Dr LEUNG Chi-bon and the Associate Professor of Department of Medicine and Therapeutics and Head of Division of Respiratory Medicine, Dr David HUI Shu-cheong, who were both senior members of the Infectious Disease Team, and Dr LUI. In the light of YY's clinical picture and the results of the tests ordered in Ward 8C, it was decided that it was neither necessary nor appropriate for YY to go through the triage ward which was used for keeping suspected cases for a period of time pending results of initial investigations. It was concluded at the time that YY should be considered as a highly suspected case of AP requiring cohorting in Ward 8A, as the Ward was admitting all the highly suspected AP cases. After the discussion, Dr LEUNG Chi-bon arranged for YY to be admitted to Ward 8A after his haemodialysis in Ward 8C.

6.42 YY's fever gradually subsided over the next 24 hours. He was afebrile by 4:00 pm on 17 March 2003 and remained afebrile until discharge.

There was significant resolution of the right lower zone infiltrate on his serial chest radiographs. On 18 March 2003, the test result of his nasopharyngeal aspirate taken on his admission on 15 March 2003 was available. It showed that there was positive identification of influenza A. On 19 March 2003, YY was discharged from Ward 8A as he remained afebrile with almost complete resolution of the changes in his earlier chest X-ray.

6.43 Dr HUI explained to the Select Committee that the clustering of cases among HCWs in Ward 8A suggested that there might be a source of infection within the medical wards. It was thought that patients, who were fit for discharge and did not have any evidence of infection, might contract the disease if they were kept in the Ward. Discharging patients from Ward 8A was for their own protection. The policy decision of discharging patients from Ward 8A was made by the hospital management at meetings of the outbreak control team. Each case of discharge was reviewed by the senior physicians in charge of the wards. The decision to allow the discharge of non-SARS patients was based on the understanding with DH that it would conduct surveillance on all discharged patients. Dr AU, however, told the Select Committee that he was not aware of such a decision.

6.44 On 22 March 2003, when YY again presented himself to Ward 8C for routine haemodialysis, he was found to be suffering from respiratory failure. He was transferred to ICU and intubated on 23 March 2003. Dr HUI told the Select Committee that YY was highly infectious around 22 March 2003 and two HCWs who attended to him during haemodialysis were infected.

When did YY contract SARS

6.45 Dr HUI considered that YY could not have contracted the disease during his stay in Ward 8A from 15 March to 19 March 2003. Dr HUI explained to the Select Committee that when YY was admitted to PWH on 15 March 2003, his body temperature was 38°C. Had YY been infected with SARS on 15 March 2003 and assuming that the incubation period was two days, he would have a fever of over 38°C on 17 March or 18 March 2003. YY, however, was afebrile by 4:00 pm on 17 March 2003 and remained afebrile

until discharge on 19 March 2003. There was also significant resolution of the right lower zone infiltrate on his serial chest radiographs in the 48 hours following his admission to PWH on 15 March 2003.

6.46 Dr HUI also explained to the Select Committee that YY had both influenza A and SARS with a most unusual phase one presentation. Most patients with SARS had persistent pneumonia during phase one followed by progression to bilateral lung disease with respiratory failure during phase two, which was around the eighth day from fever onset. The almost complete radiological resolution of YY's right lower lobe infiltrate during phase one was most atypical, although YY did have progression to phase two with bilateral pneumonia and respiratory failure on 22 March 2003.

Closure and re-opening of Ward 8A, "closure" of the Prince of Wales Hospital and closure of the Accident and Emergency Department

Closure and re-opening of Ward 8A

6.47 After 11 HCWs in Ward 8A had reported sick on 10 March 2003, a meeting chaired by Professor SUNG on that day decided that Ward 8A be closed to admission, discharge and visiting. Professor SUNG told the Select Committee that it was a decision made by him after discussion with the attendees at the meeting. At the meeting chaired by Dr LI held in the evening on the same day, it was decided that the visiting policy in respect of Ward 8A be relaxed to allow restricted visits to patients by immediate family members, in view of the complaints from the patients in Ward 8A and their family members.

6.48 The Select Committee noted that Dr LYON agreed to the above measures taken in respect of Ward 8A. According to Dr LYON, there were three patients admitted to Ward 8A on 11 March 2003 after the introduction of infection control measures in the Ward. They were discharged on 12 March 2003 and none of them was re-admitted with SARS. Dr FUNG Hong, however, informed the Select Committee that there was no new admission to Ward 8A on 11 March 2003. According to PWH's record, a patient who was admitted to Ward 8A on 27 February 2003 was transferred to Ward 10F on

6 March 2003. On 11 March 2003, he was transferred back to Ward 8A for cohorting because of suspected AP and his epidemiological link with Ward 8A.

6.49 According to Dr FUNG and Dr LYON, a total of 10 patients from Ward 8A were discharged from PWH between 11 March and 13 March 2003. Professor SUNG informed the Select Committee that the main reason for discharging patients from Ward 8A during the above-mentioned period was for their own protection. Evidence at the time suggested that the source of infection might be in the Ward. It was considered that patients who were fit for discharge and had no evidence of infection would be exposed to the risk of being infected if they stayed in the Ward. Dr LYON advised that putting them under surveillance after their discharge was appropriate for flu-like illness. As patients might still develop symptoms of the illness after being discharged, the 10 patients were advised to return to AED in PWH immediately if they had any fever or respiratory tract infection symptoms. According to Professor SUNG, DH was informed of the discharge of every patient from PWH for contact tracing, if necessary. Four of these patients were subsequently re-admitted with AP symptoms and later diagnosed to have contracted SARS.

6.50 The Select Committee learnt from Dr FUNG and Professor SUNG that Ward 11B was later opened to admit chronically ill patients from Ward 8A who were assessed not to have been infected and were unfit for discharge. A total of seven patients were transferred to the new ward for cohorting on 14 March and 15 March 2003. Only one of them was eventually found to have SARS.

6.51 At a hospital outbreak management meeting held on 13 March 2003, which was attended by the senior management staff in PWH, a decision was made to re-open Ward 8A in the afternoon for admission of patients with AP or contact history with Ward 8A. According to Professor SUNG, the opening and closure of wards was an operational issue rather than a clinical one. When asked by the Select Committee why it was decided to admit new cases to Ward 8A so soon after it had been closed on 10 March 2003, Dr LYON admitted that re-opening Ward 8A to admission would subject newly admitted patients to the risk of the unknown disease. At that time, he did not pursue the

option of opening a new ward to cohort suspected SARS patients. Dr LYON also explained that only highly suspected AP cases were admitted to Ward 8A. He held the view that in an epidemic situation where a hospital was suddenly faced with a large number of patients with what appeared to be a similar syndrome, cohorting the patients in the same ward was considered appropriate. In addition, given that there were other limitations including inadequate isolation facilities and a severe shortage of wards and HCWs in PWH, the Hospital had done its best by cohorting those patients with similar presentation.

6.52 Dr FUNG told the Select Committee that consideration had been given to using the private wards for isolation. This proposition was, however, not pursued because first, the private wards were located in a separate building and PWH wished to keep that building “clean”. Second, the private wards were located right above the Department of Obstetrics and Gynaecology and the Department of Oncology and Radiotherapy, and it was considered undesirable to place SARS patients so close to these wards. Third, the risk of infection to persons in that building was high as the air circulation along its corridors was poor.

6.53 Professor SUNG pointed out to the Select Committee that the ideal arrangement was to open a new ward to isolate infected patients. Opening a new ward for isolation, however, would require additional facilities and manpower, and HCWs were in dire shortage. He also pointed out that cohorting was an acceptable option for handling patients suffering from a flu-like disease. This was in accordance with the guidelines issued by CDC and those by HAHO.

6.54 Dr William HO and Dr KO Wing-man told the Select Committee that while they were not involved in making the decision to close Ward 8A, they considered it a prudent approach given the situation in Ward 8A at that time. They were, however, not aware of the decision to re-open Ward 8A to admission. Dr AU Tak-kwong told the Select Committee that he was not informed that patients were discharged from Ward 8A between 11 March and 13 March 2003. Had he known or been informed that patients were directly discharged from Ward 8A, DH would have put them under medical surveillance. According to Dr FUNG, Dr AU was not present at the NTEC

meeting held in the morning of 13 March 2003 when discharges were discussed, but Dr SHIU Tak-chi from DH was there. Dr SHIU, however, informed the Select Committee that he only attended the first part of the morning meeting on 13 March 2003 when the latest progress of the outbreak was discussed, including figures on the number of infected staff, the number of specimens collected and the laboratory results, as well as the separation of HCWs into a “Dirty Team” and a “Clean Team”. He then left the meeting which continued with other discussions.

“Closure” of the Prince of Wales Hospital

6.55 The Select Committee learnt that in a bid to contain the infection and alleviate the workload in PWH, the PWH management considered the need to close PWH. According to Dr FUNG, the closure of PWH meant closing down the whole Hospital and banning any person, including HCWs, from going into and out of the hospital premises. PWH recognized that such a course of action would require the Government’s authority. The closure of PWH was only briefly discussed at the morning meeting of 12 March 2003 and never turned into any substantive proposal. Dr FUNG telephoned Dr Margaret CHAN after that meeting and briefed her on the development in PWH. He also told her that the closure of PWH had been raised by some hospital staff. Dr Margaret CHAN responded that it was a major decision, and that it should be discussed with SHWF.

6.56 Both Dr HO and Dr KO told the Select Committee that during the SARS outbreak, the PWH management had never raised with them the issue of hospital closure. Neither was the issue discussed at the Daily SARS Round Up Meeting.

Closure of the Accident and Emergency Department

6.57 AED in PWH was closed on 19 March 2003. The Select Committee noted that between 12 March and 18 March 2003, the closure of AED in PWH was discussed on several occasions. Dr FUNG told the Select Committee that PWH and CUHK were looking at the matter from a microscopic angle whereas HAHO was assessing the issue from a macroscopic

perspective, having regard to the implications of closing AED in PWH on other hospitals in NTEC.

6.58 The Select Committee noted that the numbers of HCWs admitted to PWH on 12 March, 16 March and 18 March 2003 were 23, 36 and 44 respectively. The numbers of HCWs admitted to ICU on 16 March and 18 March 2003 were three and four respectively.

6.59 The events leading to the closure of AED in PWH were as follows. In the evening of 12 March 2003, Dr KO, on behalf of Dr HO, attended a meeting in PWH. Other attendees included the senior management staff in PWH, the clinicians of the Department of Medicine and Therapeutics, the members of ICT and Professor CHUNG. The proposals to close AED and to suspend the specialist out-patient (SOP) services in PWH were raised with a view to alleviating the workload in the Department of Medicine and Therapeutics where many HCWs had fallen sick, and containing the spread of the disease. Dr KO did not consider that there were sufficient justifications to close AED at that stage. He pointed out that first, as the infected HCWs were mostly from the Department of Medicine and Therapeutics, specific measures could be implemented to ease the patient load in that Department. Second, given that the spread of the disease was mainly confined to Ward 8A, the proposal of the closure of AED would not solve the problem. Third, as PWH had the heaviest patient load in NTEC, the impact of the closure of AED in PWH on other hospitals had to be assessed carefully. After discussion, it was agreed that the following measures were to be taken to address the concerns of the PWH management -

- (a) PWH would divert all non-AP medical emergency admissions to the other two acute hospitals in the same cluster, i.e. Alice Ho Miu Ling Nethersole Hospital (AHNH) and North District Hospital (NDH);
- (b) elective surgical operations would be suspended for one week to conserve the capacity of ICU;

- (c) the SOP clinics would be closed as a number of the physicians who worked in these clinics were infected; and
- (d) patients diagnosed or suspected to have AP would continue to be admitted to PWH.

6.60 Dr FUNG told the Select Committee that on learning that more HCWs had fallen sick and a PWH doctor had been admitted to ICU and intubated on 16 March 2003, he was anxious to close AED. He invited both Dr HO and Dr KO to PWH so that they could observe and understand the situation in PWH. According to Dr HO, he visited HCWs who had fallen sick and he could feel a strong sense of anxiety among HCWs in the Hospital. He had to pacify the emotions of those at the meeting before he could lead the meeting to analyze the problems and to make rational decisions. Dr HO and Dr KO pointed out at the meeting that the problems laid in the Department of Medicine and Therapeutics where many HCWs had fallen sick, and the solution was to reduce the workload in that Department. Dr HO stressed that the decision not to close AED but to divert the non-SARS emergency cases to other hospitals within NTEC on 16 March 2003 was reached after the pros and cons of the options had been discussed fully by those present at the meeting on that day. The decision was relayed to and accepted by other CCEs in the following morning.

6.61 Dr FUNG told the Select Committee that he supported the decision of 16 March 2003, although he was disappointed. There was resentment among HCWs after the decision of not closing AED was relayed to them. The matter was again brought up for discussion on 18 March 2003. According to Dr HO, the considerations behind the decision on 18 March 2003 to suspend the services of AED in PWH for three days starting from 19 March 2003, included first, one-third of HCWs in the Department of Medicine and Therapeutic in PWH had fallen sick; second, the number of SARS patients in PWH kept on increasing; third, the average period of stay for an AED patient was four to six days while for a SARS patient, it was 21 days; fourth, HCWs in PWH were facing a heavy workload and there was an increasing risk of being infected; and fifth, measures had to be taken to allay the stress and concerns of

HCWs in PWH. On 20 March 2003, it was decided that the closure of AED in PWH would be extended for one more week.

6.62 Dr KO informed the Select Committee that HAHO had planned forward and alerted other hospitals to prepare for receiving additional patients arising from the respective decisions to divert emergency medical patients on 13 March 2003 and to suspend the AED services on 19 March 2003. Through coordination by HAHO and the cluster management, AHNH had adopted the following actions as from 13 March 2003 -

- (a) to transfer all the SARS and suspected SARS cases to PWH and the Princess Margaret Hospital (PMH);
- (b) to decant the non-SARS medical patients to NDH, the Tuen Mun Hospital, Yan Chai Hospital (YCH) and Caritas Hospital;
- (c) to decant the non-SARS paediatric cases to NDH, YCH and PMH;
- (d) to use Wards E1 and F1 in AHNH for admitting patients with respiratory symptoms;
- (e) to stop all the medical elective admissions; and
- (f) to strengthen the convalescent support of the Tai Po Hospital and Shatin Hospital for AHNH.

6.63 Dr KO informed the Select Committee that AHNH adopted an overflow arrangement for medical patients internally from 15 March 2003, and also stopped all elective surgical operations from 18 March 2003. Furthermore, HAHO and CCEs agreed that all the non-SARS patients, from 19 March 2003, would be decanted within and outside NTEC whenever AHNH was full.

Communication between the Prince of Wales Hospital and the Head Office of
the Hospital Authority

Deployment of additional staff to the Prince of Wales Hospital

6.64 The Select Committee noted that decisions on matters requiring coordination by or approval of HAHO, such as the diversion of certain services to the hospitals in another cluster within HA, were made at HAHO. For those decisions concerning hospital activities that did not have an impact on other hospitals, such as the admission policy for a specific ward, the PWH management did not need to consult HAHO. According to Dr FUNG, the PWH management had kept HAHO informed of the development of the outbreak at PWH from the outset.

6.65 Dr HO told the Select Committee that soon after the PWH outbreak, he was concerned about the shortage of HCWs in PWH. He had appealed to HCWs for volunteers within HA to assist PWH and some 40 HCWs from various hospitals had responded to the appeal. Regarding the manpower redeployment within NTEC, it was a matter for its CCE. As the number of SARS patients in PWH continued to increase, there was a need to alleviate the workload in PWH. Arrangements were made to divert certain services from PWH to the hospitals in another cluster, and to redeploy manpower after discussion with CCEs.

Daily SARS Round Up Meeting

6.66 The Select Committee noted that daily meetings between Dr HO, the functional Directors of HA and CCEs were held between 15 March and 24 March 2003 to monitor the situation in PWH, share experience, review service provision, consider the need to divert services from one hospital to another, etc. These meetings were later formalized with an expanded membership and named the Daily SARS Round Up Meetings.

Central Committee on Infection Control

6.67 At the working level, the Ward 8A situation was discussed at the combined meetings of the Central Committee on Infection Control (CCIC) and the Working Group on SCAP on 12 March, 14 March and 18 March 2003. CCIC was named the Task Force on Infection Control before 4 March 2003. The Convenor of CCIC and the Working Group on SCAP, Dr LIU Shao-haei, was responsible to Dr KO on infection control matters. At the meeting on 12 March 2003, information on the numbers and types of HCWs infected, their clinical presentation and the preliminary laboratory findings were discussed, and the infection control measures considered. On 14 March 2003, the meeting was given an update on the situation in PWH. On 18 March 2003, a more detailed description of the epidemiology of the Ward 8A outbreak, including the index case and the finding that the nebulizer was the possible cause of extensive infection in the Ward, was presented. CCIC and the Working Group on SCAP were subsumed under the Daily SARS Round Up Meeting as from 24 March 2003.

6.68 The Select Committee learnt from ICO of the Queen Mary Hospital, Dr SETO Wing-hong, that after the meeting on 12 March 2003, he sent an email to Dr LIU on 13 March 2003 expressing his disappointment at the lack of epidemiological data from PWH. As he did not receive any reply from HAHO, he wrote another email to Dr LIU on 14 March 2003 expressing a similar concern. Dr SETO told the Select Committee that he did not receive any response from HAHO at that time, and he did not know whether any action had been taken by HAHO subsequently.

6.69 Dr LIU explained to the Select Committee that he had relayed Dr SETO's message of 13 March 2003 to PWH. As the outbreak at PWH had just started, the epidemiological data was not readily available then. He did not reply to Dr SETO's email because as a member of CCIC, Dr SETO had been kept posted of the situation in PWH. Dr SETO was present at the meeting on 14 March 2003 where there was a presentation of the up-to-date situation of PWH. In Dr LIU's view, there was no communication problem between him and Dr SETO.

6.70 The Select Committee noted that the notes of the CCIC meetings were brief. It was therefore uncertain whether some important measures such as the admission policy for Ward 8A in PWH had ever been discussed at these meetings. Dr LIU told the Select Committee that PWH did not inform him of the re-opening of Ward 8A to admission.

6.71 When asked by the Select Committee whether CCIC had offered advice on infection control and assistance to PWH, and whether he had ever sought CCIC's assistance given the rapidly developing crisis in PWH, Dr LYON replied in the negative. Dr LYON admitted that, in retrospect, he wished that he had. He explained that he sought assistance within the Hospital and NTEC to help PWH combat the outbreak. He did not seek assistance beyond the cluster because at that time, he believed that the help he was getting was probably enough to manage the challenges that PWH was facing.

Epidemiological study and contact tracing

6.72 A number of epidemiological studies and contact tracing activities were carried out by PWH, the Faculty and DH during the SARS outbreak. Although the main purpose of all these studies and activities was to control the outbreak, each of them had a different emphasis. Details of these studies and activities, plus the interaction between the various parties carrying out such studies and activities, are covered in the ensuing paragraphs.

Disease Control Centre

6.73 PWH set up DCC on 12 March 2003, the day following the admission of 23 HCWs. Dr Nelson LEE Lai-shun from the Department of Medicine and Therapeutics was responsible for setting up the system for the collection of clinical and epidemiological data. The day-to-day operation of DCC and the collation of data were overseen by Dr Louis CHAN Yik-si from the Department of Obstetrics and Gynaecology, who joined DCC as the Officer-in-charge on 14 March 2003. The functions of DCC were as follows -

- (a) to provide accurate statistics on the patients admitted for AP;
- (b) to collect the demographic data of the admitted patients;
- (c) to identify the likely source of infection;
- (d) to monitor the clinical course and outcome of the patients;
- (e) to provide a database to facilitate contact tracing; and
- (f) to serve as the channel of communication internally with the various clinical departments and externally with HAHO and DH.

Contact tracing by the New Territories East Regional Office

6.74 Contact tracing refers to the identification of persons who had contact with a patient suffering from an infectious disease. The purpose of contact tracing is to reduce the risk of secondary transmission through health surveillance or isolation of contacts. DH's contact tracing in relation to the outbreak at PWH between 10 March and 28 March 2003, which is the focus of the Select Committee's study as set out in paragraph 6.4 above, covered only close contacts. According to WHO's definition, close contacts include those who have lived with, cared for, or handled respiratory secretions of patients. On 28 March 2003, Dr Margaret CHAN told members of the Legislative Council Panel on Health Services that at that moment, only close contacts of SARS patients would be subject to medical surveillance. As persons who had causal contact with SARS patients posed virtually no or very little risk to other people, they would not be subject to surveillance under the Quarantine and Prevention of Disease Ordinance (Cap. 141). Nevertheless, they were asked to contact DH directly. In this particular case, causal contacts of SARS patients, especially those who had visited Ward 8A in PWH and the ninth floor of the M Hotel, were asked to contact DH directly.

6.75 DH commenced contact tracing work and designed a questionnaire for this purpose on 11 March 2003. NTERO interviewed 26 HCWs during

that night and the survey data was analyzed immediately. The findings were presented to the PWH management at a meeting in the following morning. Based on the findings, PWH and NTERO worked out an agreed case definition for “active case finding and surveillance”. According to Dr AU, DH had investigated all the cases falling within the case definition reported by PWH, from the outset of the outbreak at PWH. In the light of the evolving circumstances, the case definition was revised on 17 March 2003.

6.76 On 12 March 2003, DH set up a Special Control Team at NTERO to deal with the outbreak. Between 13 March and 31 March 2003, DH stationed a team of staff at DCC of PWH (the DH Team) to facilitate timely communication with PWH on outbreak investigation and contact tracing. According to Dr Louis CHAN, DCC gave information directly to the DH Team. It was for the DH Team to decide whether such information would be further passed to NTERO.

6.77 According to Dr Louis CHAN, the soft copy of a “master list” with information about suspected and confirmed SARS patients in PWH was given to DH on a daily basis. Based on the “master list”, the DH Team interviewed the patients on the list at the ward and completed the questionnaire designed for contact tracing. Prior to 20 March 2003, the “master list” contained, on a separate page, a list of the newly admitted, transferred, or discharged patients. From 20 March 2003, a “patient movement list”, putting together information of patients who were newly admitted, transferred to another ward or ICU, or discharged, was also given by DCC to DH to facilitate contact tracing.

6.78 According to Dr AU, the information flow in respect of the cases for follow-up by the DH Team and NTERO was as follow. First, the names of the patients who satisfied the case definition were sent by fax to DCC by PWH clinicians. The DCC clerical staff then input the details of these patients into their database. In parallel, the PWH doctor(s) in DCC, together with the PWH clinicians, identified the urgent/serious cases and referred them to the DH Team for immediate investigation. The daily list given to the Special Control Team at NTERO through the DH Team thus contained the names of some patients who were reported by clinicians as satisfying the case definition but had not been referred to the DH Team earlier in the day for urgent action.

The understanding of Dr Louis CHAN, however, was that it was neither the duty of PWH doctors nor that of DCC to identify urgent/serious cases and refer them to the DH Team for its immediate investigation. In his view, whether a case was urgent or serious was a public health decision to be made by the DH Team or DH.

6.79 Dr AU told the Select Committee that until 19 March 2003, the daily lists from DCC, initially provided in hard copy, were compiled in a cumulative manner with new and old cases mixed together without any particular order or without indication of the new cases. NTERO then requested PWH to provide the soft copy of “master list” to enable NTERO to identify the new cases by sorting the names on the current day’s list and previous day’s list in alphabetical order. The first soft copy was made available on 15 March 2003. Dr Louis CHAN, however, disagreed that the new cases were not shown on the “master list”, as there was a specific column showing the admission dates of the patients.

6.80 According to Dr AU, on receipt of the daily list, NTERO compared it with the previous lists to identify the new cases. It then looked for and followed up those cases which had not been investigated by the DH Team. These cases were normally investigated by the nurses in NTERO by telephone. If the contacts of a SARS patient could not be traced because no telephone number was provided in the “master list”, the nurses in NTERO would seek the assistance of the PWH staff in the ward to obtain such information from the patient. If the PWH staff could not obtain the telephone number from the SARS patient or if the contacts of the SARS patients could not be reached by telephone, NTERO would then refer the case to the DH Team for direct face-to-face interview with the SARS patients in the ward.

Contact tracing of YY

6.81 Evidence obtained by the Select Committee indicates that there might have been a misunderstanding between DH and PWH as to how the master lists given by DCC to the DH Team should be followed up, especially when DCC introduced the new arrangement on 20 March 2003 whereby a “new case list” or “patient movement list” was included in the master list.

This misunderstanding might have caused some delay in tracing YY, who was later identified to be the index case of the Amoy Gardens outbreak, when he was discharged from PWH on 19 March 2003. Dr Louis CHAN told the Select Committee that information on YY was in the “master lists” passed to the DH Team respectively on 16 March, 17 March, 18 March and 19 March 2003. YY was discharged from PWH on 19 March 2003. His name was included in a “patient movement list” as a “discharge case” and passed to the DH Team on 20 March 2003.

6.82 According to Dr AU, there was no record of YY being interviewed by DH before his re-admission to PWH on 22 March 2003. Dr AU described the likely scenario as follows. The name of YY first appeared on the list sent by fax by the DH Team to NTERO at about 6:00 pm on 16 March 2003. The DH Team did not take immediate follow-up on YY on 16 March 2003. The name appeared again on the list of 17 March 2003, and the Special Control Team at NTERO initiated follow-up action on that day. As the list did not contain the telephone number of YY for the purpose of contact tracing, the Special Control Team sought the assistance of the PWH ward staff. When the telephone number was still not available by the evening of 17 March 2003, the case was referred to the DH Team for direct face-to-face interview on 18 March 2003. By then, YY was tested positive for influenza A; hence, no follow-up action was taken. A “new case list” dated 20 March 2003 and with the time “15:27 hours” marked on it was received by NTERO for follow-up action, but the name of YY was not on the list. According to Dr AU, NTERO did not receive the “patient movement list” of the same date which PWH claimed to have sent to NTERO at the time. Dr Louis CHAN informed the Select Committee that DCC did not send the list to NTERO because the list had already been given to the DH Team. Whether NTERO received in a timely manner all the information that DCC had passed to the DH Team depended on the DH Team.

6.83 Dr AU informed the Select Committee that he knew of and obtained a copy of the “patient movement list” of 20 March 2003 only shortly before the Select Committee’s hearing. Dr AU emphasized three points to the Select Committee. First, NTERO did not receive the list at the material time. Second, the list stated that YY was “home” on 20 March 2003 when in fact he

was discharged on 19 March 2003. Third, the “patient movement list” of 20 March 2003 contained more names than the “new case list” of 20 March 2003 which meant that it would have been prepared after the latter was available at 15:27 pm on 20 March 2003. As YY went back to Shenzhen on 20 March 2003, no contact tracing by DH was possible by that time.

6.84 Dr AU told the Select Committee that he found it difficult to understand why accommodation at PWH was provided for HCWs who had contact with patients in Ward 8A, and yet patients, such as YY, were directly discharged from Ward 8A. Had DH known or been notified that patients were directly discharged from Ward 8A, DH would have followed up the cases.

6.85 The Select Committee noted that NTERO was notified of the re-admission of YY on 23 March 2003. NTERO managed to contact YY’s father on 24 March 2003 and was told that all family contacts were asymptomatic. On 25 March 2003, YY’s father reported that YY’s brother, who lived with his wife in Block E of the Amoy Gardens, had developed a fever and cough, and was admitted to the United Christian Hospital on 24 March 2003. NTERO referred the case of YY’s brother to the Kowloon Regional Office (KRO) of DH for further investigation immediately. KRO conducted contact tracing of YY’s brother on the same day. The wife of YY’s brother did not have any symptoms then and was put under medical surveillance. She worked in an elderly home and had taken leave since 25 March 2003.

6.86 On 26 March 2003, on being notified of an outbreak in Block E of the Amoy Gardens, KRO conducted a site visit in the afternoon and interviewed the wife of YY’s brother, among other residents. She was still asymptomatic. She was instructed to report to KRO should she develop symptoms. On 30 March 2003, DH was notified that the wife of YY’s brother had been admitted to PMH because of fever. KRO conducted contact tracing for her workplace contacts. None of the residents and employees in the elderly home in which the wife of YY’s brother worked was infected throughout the surveillance period.

6.87 In the course of investigation, it was revealed that YY stayed at his brother’s home in Block E of the Amoy Gardens on 14 March and 19 March

2003. When asked by the Select Committee when it was likely that YY had spread the disease in the Amoy Gardens, Dr David HUI responded that DH reported that some SARS patients from the Amoy Gardens already developed symptoms on 21 March 2003. As YY was only discharged from PWH on 19 March 2003, he might not be related to such cases, given that the mean incubation period of SARS was between four and 7.2 days.

6.88 Dr HUI, however, pointed out to the Select Committee that the incubation period of the SARS cases handled by PWH ranged from two to 10 days, and that YY was more infectious on 19 March 2003 than on 14 March 2003. Dr HUI also considered that the probability of YY being infectious on 14 March 2003 and not infecting anyone until 21 March 2003 was lower than that of YY spreading the disease on 19 March 2003.

Manpower and performance pledge for contact tracing

6.89 In the light of the speed and scale of the SARS outbreak at PWH, DH had to redeploy more staff to NTERO from the very beginning to cope with the increasing workload. Manpower had been doubled by the second week of the outbreak and tripled by the third. NTERO also streamlined its surveillance procedure to expedite the contact tracing work. NTERO estimated the likely time of having onset of symptoms during the incubation period and worked out five intervals for medical surveillance. Instead of calling the contacts every day, NTERO called the contacts at each of these five intervals. To cope with the workload, staff in NTERO were required to work extended hours.

6.90 Dr FUNG told the Select Committee that he was upset on 17 March 2003 when he perceived that the contact tracing work had lagged behind following the rapid increase in the number of AP/SARS patients admitted to PWH. Dr FUNG was further upset by the fact that DH could not provide him with epidemiological updating on whether and when there would be a second wave of the outbreak. The information was needed to ascertain the effectiveness of the infection control measures. The Select Committee noted that DH sent the Community Physician (New Territories West), Dr Teresa CHOI Man-yan, on 18 March 2003 to cover for Dr AU who was on sick leave.

6.91 On 20 March 2003, it was learnt that two private medical practitioners who came down with the disease after seeing patients of Ward 8A and the patients' contacts, had not been contacted by DH. On the same day, after meeting the senior management staff in PWH and members of the Faculty and being convinced of the possible danger of the disease having spread in the community, Dr William HO called Dr LEUNG Pak-yin at about midnight that day and requested him to step up contact tracing. Dr LEUNG Pak-yin paid a visit to DCC in the following morning. When Dr YEOH knew of the possible delay in contact tracing, he also stepped in and asked that it be expedited. A Principal Medical Officer was deployed from the Headquarters of DH to reinforce the Special Control Team in NTERO.

6.92 Regarding the two infected private medical practitioners, Dr AU told the Select Committee that NTERO had conducted contact tracing in respect of the two patients from Ward 8A and their contacts. The two patients who were put under surveillance after their discharge denied that they had seen any private medical practitioners when being interviewed. When the contacts of one of the patients informed NTERO that they had seen a private medical practitioner, NTERO immediately contacted the medical practitioner concerned. As the medical practitioner was on sick leave, NTERO was unable to reach him. The circumstances of the other medical practitioner were similar.

6.93 The pledge given by DH was to commence investigation into reported cases and contact tracing within 24 hours of receipt of the relevant reports. All contacts were checked to ascertain whether they had developed symptoms, and they were asked to inform NTERO if they fell sick. They were also given advice on personal hygiene and measures to prevent respiratory tract infections. Symptomatic contacts were advised to attend AED in PWH. The contacts were put under medical surveillance for 14 days from the last day of exposure to a reported case. The period of medical surveillance was later changed to 10 days when the incubation period was better defined. Dr AU told the Select Committee that the contacts of about 3% of the reported cases in PWH could not be reached within 24 hours of the receipt of the cases, as DH had pledged.

6.94 In the month of March 2003, DH followed up about 480 reported cases and 2 000 contacts related to the PWH cluster. A total of 146 persons out of the 480 reported cases were subsequently confirmed to have SARS. In addition, 59 confirmed cases were identified from the 2 000 contacts traced.

Division of labour between the Department of Health and the Prince of Wales Hospital for epidemiological study and contact tracing

6.95 According to Dr LUI Siu-fai, who managed the data collected by DCC, he performed “Line Listing and Descriptive Epidemiology” to sort out the contact history of a patient in terms of “who got infected, when and where”, with a view to supporting ICT in conducting outbreak investigation. Basic data of the patients was compiled by DCC under the supervision of Dr Louis CHAN.

6.96 Professor WONG Tze-wai, who had been involved in the investigation of SARS since 14 March 2003 when he attended a meeting in PWH upon the invitation of Professor CHUNG, focused his epidemiological investigations into the initial outbreak in terms of the transmission route of SARS and the risk factors for contracting the disease. He was assisted by 10 research nurses from the Faculty. Since 24 March 2003, he had collaborated with three WHO consultants for a month as the principal investigator of the outbreak investigation until the production of a WHO report on the PWH outbreak by one of the WHO consultants.

6.97 The demographical, clinical and close contact data of the infected patients was collected by members of the DH Team and recorded in a questionnaire designed by DH for contact tracing. The data was then compiled by DCC. The data was also centralized and computerized in an epidemiological investigation tool, EPI-INFO, in NTERO. The database was used for epidemiological analysis, including charting of the epidemic curve for projection of the pattern of infection, working out the case definition for contact tracing, as well as estimating the incubation period and probable mode of spread of the disease.

6.98 As regards the division of labour for contact tracing work, there appeared to be some misunderstanding between DCC and DH. Both Dr LUI Siu-fai and Dr Louis CHAN told the Select Committee that PWH did not conduct any contact tracing in respect of patients (including the infected HCWs), as the tracing of patients' contacts in the community was the responsibility of DH. According to Dr FUNG, the initial agreement with DH was that DH was responsible for tracing the contacts in the community, and that included discharged patients and visitors.

6.99 Dr AU, however, told the Select Committee that while contact tracing was the responsibility of DH, DH would trace the contacts of those infected HCWs and patients who satisfied the case definition for "active case finding and surveillance" only, as agreed between DH and PWH at the meeting on 12 March 2003. In addition, when the PWH index patient was identified on 14 March 2003, DH and PWH further agreed that PWH would follow up those HCWs, medical students and in-patients exposed to *JJ*, while DH would follow up the discharged patients (non-SARS) and hospital visitors exposed to *JJ*. Specifically, DH would follow up the patients discharged from Ward 8A and visitors exposed to *JJ* before 10 March 2003 only. Dr AU told the Select Committee that his understanding of only tracing patients discharged from Ward 8A before 10 March 2003 was supported by the following. First, following the decision to close Ward 8A on 10 March 2003, no patient should be discharged from Ward 8A before the index patient was identified; second, he did not receive any "patient movement list" or "patient discharged list" from PWH requesting DH to follow up patients discharged from Ward 8A after 10 March 2003; and third, had DH known or been notified that patients had been directly discharged from Ward 8A, DH would have conducted surveillance on them.

Analysis

Closure of and re-opening of Ward 8A

Re-opening of Ward 8A

6.100 The Select Committee has examined the various decisions on closing and re-opening Ward 8A, using it as a cohort ward for AP patients and discharging patients directly from the Ward. The Select Committee considers that it was prudent to close Ward 8A to admission, discharge and visiting on 10 March 2003. As very little was known about the disease at that time, the decision not to admit new patients to Ward 8A should not be reversed on 13 March 2003. The Select Committee finds the decision to re-open Ward 8A unfortunate.

Cohorting atypical pneumonia patients in Ward 8A

6.101 The Select Committee notes that Ward 8A was used as the cohort ward for highly suspected AP patients starting from 13 March 2003. Professor Joseph SUNG explained to the Select Committee that cohorting was an acceptable option in handling patients suffering from flu-like illnesses, and it was also congruent with the guidelines issued respectively by CDC and HAHO. The Select Committee does not dispute the cohorting arrangement. The Select Committee is, however, astonished that Ward 8A was used as a cohorting ward. The Select Committee is of the view that the Ward should not be used for cohorting at that time for a number of reasons. First, the Ward was the “epicentre” of the outbreak of an unknown disease. Second, the disease was highly infectious, as demonstrated by the large number of HCWs being infected. Twenty-three HCWs were admitted to PWH on 12 March 2003 and the figure had almost doubled by 18 March 2003. Third, the mode of transmission was still unknown at that time. Fourth, the index patient had not yet been identified. It should be quite obvious that placing a newly admitted patient in a “dirty” ward would expose that patient to the risk of contracting the disease.

6.102 A number of witnesses from PWH told the Select Committee that at that time, no other “clean” wards were ready for taking the continuous influx of AP patients, and that PWH had no other options, given the limitation in resources. While the Select Committee appreciates the immense difficulties faced by PWH at that time, it is of the view that PWH should have made the best endeavours to make available at least one “clean” ward for cohorting suspected SARS patients. The Select Committee notes that YY, who was later identified as the index case of the SARS outbreak at the Amoy Gardens, was admitted to Ward 8A when it was being used as a cohorting ward.

6.103 Dr David HUI explained to the Select Committee that YY could not have contracted the disease during his stay in Ward 8A from 15 March to 19 March 2003, as YY was re-admitted to PWH with phase two presentation of SARS on 22 March 2003. Dr HUI believed that YY had already contracted the disease before his first admission to PWH on 15 March 2003.

6.104 Dr HUI’s explanation, however, could not remove the doubt of the Select Committee about when YY contracted SARS. The Select Committee notes from the records of the SARS patients from the Amoy Gardens treated at PMH that at least two patients were admitted to ICU within five days after onset of illness, and that the lower limit of the incubation period of SARS was two days. It is therefore possible for YY to have contracted SARS after admission to Ward 8A on 15 March 2003 and exhibited those symptoms as described by Dr HUI on 22 March 2003. Perhaps it would never be known exactly when and how YY contracted the disease and whether any new patients admitted to Ward 8A after 13 March 2003 had contracted SARS. Nevertheless, it would appear not prudent to admit new patients, including YY, to Ward 8A which was a “dirty” ward.

Discharge of patients from Ward 8A

6.105 On 11 March 2003, PWH started to directly discharge from Ward 8A patients who were fit for discharge and did not have any evidence of infection, in order not to expose them to the risk of infection. As PWH did not have the statutory power to detain patients and it was PWH’s assumption that the discharged patients would be under the medical surveillance of DH, the

Select Committee considers PWH's decision understandable. The Select Committee also notes that the incubation period of SARS was not known and no "step-down" arrangement was established at that time.

Closure of the Accident and Emergency Department

6.106 The Select Committee has considered whether the decision to close AED in PWH should have been made earlier, i.e. on 12 March 2003 when Dr KO Wing-man visited PWH, or on 16 March 2003 when both Dr William HO and Dr KO visited PWH. Having examined the reasons put forward by Dr KO and the measures taken to address the concerns of the management of PWH, the Select Committee finds it acceptable not to close AED on 12 March 2003. HAHO, however, should have made sufficient forward planning in preparing other hospitals to cope with additional patients in the event that PWH had to close its AED at short notice.

6.107 The Select Committee notes that the situation in PWH on 16 March 2003 was different from that on 12 March 2003. On 12 March 2003, 23 HCWs were admitted to PWH. By 16 March 2003, the number had risen to 36 and three HCWs had been admitted to ICU. Dr FUNG was anxious to close AED. He invited Dr HO and Dr KO to visit PWH for them to obtain firsthand information of the situation. Dr HO admitted that he felt there was immense anxiety among HCWs. After considering the pros and cons, it was decided not to close AED but to divert the non-SARS emergency cases to other hospitals within NTEC.

6.108 The Select Committee also notes that the issue of the closure of AED was brought up for discussion again on 18 March 2003. By that time, eight more HCWs had been admitted to PWH and one more HCW had been admitted to ICU and required intubation. It was then decided that AED should be temporarily closed for three days starting from 19 March 2003. Dr HO explained to the Select Committee that there were various reasons behind the decision. One of the reasons was the need to allay the stress and concerns of HCWs in PWH.

6.109 The Select Committee notes that there was little difference between the situation in PWH on 16 March and 18 March 2003. Nevertheless, the decision to close AED was only made on the latter date. The Select Committee believes that HAHO did not give sufficient weight to staff morale and sentiments at PWH when deciding not to close AED on 16 March 2003. Dr FUNG informed the Select Committee that he was disappointed at the decision of not closing AED on 16 March 2003. The Select Committee is of the view that staff morale and sentiments were very important and should have been given more weight when deciding whether or not to close AED on 16 March 2003. The Select Committee also considers that by that time, HAHO should have made sufficient forward planning in preparing other hospitals to cope with extra patient load in the event that PWH had to close its AED at short notice.

Contact tracing

6.110 The Select Committee has examined how contact tracing work in respect of the PWH cluster was undertaken by DH. As set out in paragraphs 6.74 to 6.83 above, there were clearly confusion and misunderstanding in the passing of information between PWH and DH. The Select Committee considers that in the light of the situation at the early stages of the outbreak at PWH, some confusion and misunderstanding in the communication between PWH and DH were understandable.

6.111 As far as contact tracing work is concerned, the Select Committee considers that there was delay in following up the contacts at the early stage of the outbreak at PWH and the main reason was inadequate manpower. The Select Committee is of the view that had there been adequate manpower to undertake contact tracing work, it would not have been necessary for NTERO to prioritize the cases in hand, as discussed in paragraph 6.78 above. Moreover, even if prioritizing was necessary and the more urgent cases were followed up first, the apparently less urgent cases, such as the case of YY, could have been dealt with more expeditiously.

6.112 The Select Committee finds that the unfortunate slippage of YY through the contact tracing system was the result of an unusual combination of

factors, including YY being diagnosed to have influenza A. The Select Committee notes that although YY was first admitted to PWH on 15 March 2003, no follow-up action was initiated until 17 March 2003. Even on 17 March 2003, NTERO had to wait for the ward staff in PWH to obtain YY's telephone number. When the number was not available, it was decided on 18 March 2003 that a face-to-face interview would be conducted. By then, YY had been tested positive for influenza A and no follow-up action was considered necessary by DH. The Select Committee accepts that even if YY was put under medical surveillance after his discharge on 19 March 2003, the outbreak at the Amoy Gardens could not have been avoided. Timely medical surveillance on YY, however, could have given earlier warning to HAHO and DH of a possible outbreak at the Amoy Gardens.

Role of the Infection Control Officer

6.113 The Select Committee has examined the role of Dr Donald LYON as an ICO during the outbreak. The Select Committee notes that in the first two days of the outbreak at PWH, Professor SUNG took the lead in making decisions on infection control measures. Starting from 12 March 2003, meetings of the outbreak control team were chaired by Dr FUNG Hong and decisions on infection control measures were made collectively at these meetings. The Select Committee also notes that the setting up of step-down wards at PWH was not initiated by Dr LYON, but by Professor SUNG

6.114 Dr LYON told the Select Committee that AP patients should be cohorted in a "clean" ward rather than in a "dirty" ward (Ward 8A), but he did not insist on this practice being followed in PWH. He agreed that to some extent it might have been wrong to have diverted more resources to stopping the outbreak than to identifying the index patient. He also admitted that he had not sought advice or assistance from CCIC, although he should have done so when PWH was under great strain. The infection control measure suggested by him of grouping infected patients in the rear cubicles and those not infected in the front cubicles of Ward 8A was not effective for the purpose of segregating the infected and uninfected patients.

Relationship between the Prince of Wales Hospital and the Head Office of the Hospital Authority

6.115 The Select Committee notes that additional manpower was deployed to PWH from hospitals within and outside NTEC during the outbreak, and Dr HO and Dr KO personally participated in the discussions of some of the major decisions made in respect of PWH.

6.116 As far as communication between HAHO and PWH is concerned, the Select Committee considers that it was inadequate at times. For instance, Dr HO and Dr KO were not informed by PWH of the important decision of re-opening Ward 8A for new admission.

6.117 The Select Committee has examined the role of CCIC in the handling of the outbreak at PWH. Dr LIU Shao-haei told the Select Committee that CCIC had maintained daily contact with ICT in PWH to obtain the up-to-date number of admissions of HCWs and patients with AP since the outbreak at PWH on 10 March 2003. The Select Committee notes that CCIC held meetings on 12 March, 14 March and 18 March 2003 to discuss the situation in PWH before it was subsumed under the Daily SARS Round Up Meeting as from 24 March 2003.

6.118 The Select Committee notes that PWH received some external assistance on infection control. Experts from CDC in Atlanta were invited to give advice on infection control measures in PWH. As the epidemic evolved, Dr LYON updated the guidelines for NTEC in response to the changing circumstances. Most of these infection control guidelines were later adapted by HAHO and used as the standard guidelines for other hospitals. PWH also took the initiative to share with other hospitals its experience in handling the outbreak.

Performance and Accountability

The Prince of Wales Hospital

6.119 The Select Committee considers that while there were areas in which PWH could have done better, the overall performance of HCWs in PWH during the SARS outbreak was commendable. Under the leadership of the PWH management, HCWs in PWH displayed great courage in and devotion to their work. They inspired their fellow HCWs and set high standards of professionalism for other hospitals to follow.

6.120 As HCE, Dr FUNG Hong was responsible for the overall handling of the SARS outbreak at PWH. The Select Committee notes that the outbreak at PWH was sudden and overwhelming. The senior management staff in PWH led by Dr FUNG demonstrated leadership and a strong sense of duty in handling the outbreak. They assumed responsibilities readily, solve problems decisively, and oversaw the implementation of important and often difficult decisions under very trying circumstances.

6.121 For the reasons set out in paragraphs 6.113 and 6.114 above, the Select Committee finds the performance of Dr Donald LYON as ICO of PWH somewhat disappointing during the outbreak. Dr LYON also failed to seek necessary assistance from HAHO to help control the spread of the disease in PWH.

6.122 Notwithstanding the commendable overall performance of the management and frontline HCWs in PWH, the Select Committee considers the decision to re-open Ward 8A and to use it as a cohort ward for AP patients on 13 March 2003 less than prudent. The Select Committee is of the view that Dr FUNG, as HCE of PWH, should be held responsible for this decision.

Head Office of the Hospital Authority

6.123 The Select Committee notes the efforts of Dr William HO to obtain firsthand information to understand the situation in PWH under very trying circumstances. Dr HO, however, did not give sufficient weight to staff

morale and sentiments in considering whether or not to close AED in PWH on 16 March 2003.

6.124 The Select Committee is of the view that the decision made by Dr KO Wing-man on 12 March 2003 of not closing AED was acceptable. At that stage, however, there was insufficient forward planning on the part of Dr HO and Dr KO in preparing other hospitals to cope with the additional patients diverted from PWH should the situation in PWH deteriorate and warrant the closure of its AED.

Department of Health

6.125 The Select Committee is of the view that DH failed to provide NTERO with adequate manpower promptly to cope with the workload on contact tracing of PWH cases, contributing to the slippage of YY through the contact tracing system.