# Chapter 12 Outbreak at the Tuen Mun Hospital

## Finding of facts

Focus of inquiry

12.1 The Tuen Mun Hospital (TMH) started to receive SARS patients referred by the four designated medical centres (DMCs) of the Department of Health (DH) on 12 April 2003. As there was an outbreak of SARS in Ward C8 in the Hospital in late April 2003 when more was known about the disease, the Select Committee has focused its inquiry on the preparation of TMH to admit SARS patients referred by DMCs and the infection control measures implemented in TMH.

Preparation for receiving SARS patients

12.2 In view of the increasing number of SARS cases in Hong Kong, TMH started in mid-March 2003 to make the necessary preparation for the admission of SARS patients. A core group, led by the Cluster Chief Executive (New Territories West)/Hospital Chief Executive of TMH, Dr CHEUNG Wai-lun, and comprising department heads in TMH was formed in mid-March 2003 to discuss the contingency measures that should be taken if SARS patients were to be admitted. It was agreed that patients with a fever were to be triaged in the Accident and Emergency Department (AED) in TMH, and two wards would be used as isolation wards for cohorting patients with a fever. Three Adult SARS wards providing up to about 100 Adult SARS beds were planned. One Paediatric SARS ward providing up to about 30 Paediatric SARS beds was also planned. Based on the estimate that about 15% to 20% of the SARS patients would require Intensive Care Unit (ICU) treatment, 20 SARS ICU beds were also planned.

12.3 On 26 March 2003, Ward A5 in TMH was opened as its first SARS ward and started to receive SARS patients. "Confirmed" and "suspected" SARS patients clinically diagnosed according to the case definition of SARS were admitted to the SARS ward. These patients were segregated in the

SARS ward. Wards B5 and D5 were also converted into SARS wards on 13 April and 18 April 2003 respectively. Infection control measures in line with the guidelines of the Head Office of the Hospital Authority (HAHO) were put in place in TMH. The personal protective equipment (PPE) available to healthcare workers (HCWs) included caps, masks (surgical and N95), eye protection apparels (eye shields/goggles/masks with visors/face shields), gloves and protective gowns.

12.4 On 11 April 2003, it was decided at the Daily SARS Round Up Meeting that the Princess Margaret Hospital (PMH) would stop all new admissions of SARS patients referred by the four DMCs with effect from the following day. It was also agreed at the meeting that the SARS patients referred by DMCs and AED in the Yan Chai Hospital (YCH) would be admitted to TMH.

12.5 Prior to 12 April 2003, TMH had already admitted 28 SARS patients and eight suspected SARS patients. Six of these patients were subsequently admitted to ICU. At that time, there were two SARS wards in operation, one for adult patients and the other for paediatrics patients. The numbers of HCWs working in these two SARS wards were 35 and 34 respectively. There were 62 HCWs working in ICU.

12.6 One of the concerns of the Select Committee was whether TMH had adequately prepared itself before admitting SARS patients referred to it by DMCs. The Select Committee was told by the Infection Control Officer (ICO), Dr QUE Tak-lun; the Chief of Service (COS) of ICU, Dr LEE Tsun-woon; and COS of the Department of Medicine and Geriatrics, Dr Simon CHOW Liang, that although they had not been consulted on the decision of HAHO, they considered that TMH could cope with additional SARS patients from 12 April 2003 onwards, and that the preparation time was adequate, because TMH had started to make the necessary preparation since as early as mid-March 2003.

Total number of people infected

12.7 By the end of the SARS epidemic, a total of 91 SARS patients had been treated in TMH, with 14 HCWs infected. Two HCWs in TMH died of SARS. No visitor to TMH was infected.

SARS outbreak in Ward C8

12.8 On 26 April and 27 April 2003, three HCWs working in Ward C8 reported sick and were hospitalized for having developed SARS symptoms. This was immediately regarded as a likely SARS outbreak in Ward C8. As ICO responsible for the investigation into and the management of a ward outbreak, Dr QUE, leading the Infection Control Team, commenced investigation and contact tracing immediately. The Team visited the infected HCWs and inspected the Ward to find out the possible causes of the infection and took follow-up actions. The hospital management, HAHO and DH were informed. From 27 April 2003 onwards, all patient admissions and transfer to as well as discharge from Ward C8 were stopped unless instructions were given to the contrary by the hospital management.

12.9 To control the spread of the infection, patients discharged from Ward C8 10 days prior to the earliest date of symptom onset among the cases of staff infected and their contacts were traced. The high risk patients discharged to old age homes or other institutions were called back to Ward C8 for isolation and observation. Those patients who had been discharged home and people who had been to Ward C8 were followed up by DH. They were called back once they developed SARS symptoms. A daily discharged patients list was provided to AED to facilitate the triage of patients and HCWs there were alerted to the possibility that certain patients were close/social contacts of the SARS patients in Ward C8. About 20 patients were called back from the community as a result and admitted to Ward C8 for isolation and observation. To prevent overcrowdedness of Ward C8, 15 of these patients were isolated in Ward A8.

12.10 In early May 2003, the hospital management decided to close Ward C8 for disinfection and transfer the cohorted patients there to Ward A5

which had been equipped to accommodate SARS patients. Between 2 May and 6 May 2003, 20 cohorted patients in Wards A8 and C8 were transferred to Ward A5 where more space would be allowed between beds. In addition, 11 patients were transferred to Wong Tai Sin Hospital on 6 May 2003. Ward C8 was then closed for disinfection on 7 May 2003. The last confirmed SARS patient, who was a contact case of the Ward C8 outbreak, was transferred to the SARS ward on 21 May 2003. The whole cohort and surveillance exercise finally ended on 4 June 2003.

12.11 The outbreak in Ward C8 in TMH ended in early June 2003, by which time a total of five HCWs in TMH, 10 patients and one patient's relative had been confirmed to be infected with SARS.

12.12 Dr CHEUNG pointed out to the Select Committee that the two index patients of the outbreak were "cryptic" cases. Details of the two cases were as follows -

(a) the first index patient was admitted for fever, chills and myalgia through AED in TMH on 10 April 2003, three days after returning from Shanghai. Her fever subsided shortly after admission and the patient remained afebrile. Since there was no change in her chest X-ray and no lung infiltrates even on high resolution of computerized tomography scan, the patient was not diagnosed as a SARS case. The patient responded to antibiotics and was discharged on 14 April 2003. The patient sought treatment in TMH again on 21 April 2003 and was later diagnosed as having SARS; and

(b) the second index patient was admitted to PMH on 2 April 2003 as a suspected SARS patient. This patient was subsequently classified as a non-SARS case and was discharged on 11 April 2003. The patient sought treatment in AED in TMH on 18 April 2003 and was admitted for fever, chills and myalgia. There was no change in her chest X-ray and her fever subsided shortly after admission. The

patient remained afebrile for days before she had a fever again.

Infection control

*Infection control measures*

12.13 The Infection Control Team repeatedly reminded HCWs in TMH to take droplet precautions when handling patients with atypical pneumonia since as early as mid-February 2003. The relevant guidelines were disseminated to HCWs in TMH through emails and in printed copies. In addition, cluster guidelines covering infection control as well as clinical and operational issues had been developed and were reviewed periodically. All the SARS related guidelines and information were posted on the cluster website. According to Dr QUE, he was satisfied that HCWs were in full compliance with the infection control measures in force.

12.14 In early April 2003, the cluster management was aware of the possibility that some SARS patients might not show any SARS symptoms on admission; hence, the infection control measures in all medical wards were stepped up to isolation-ward standard.

12.15 The Select Committee noted that some frontline HCWs had expressed concern about the keeping of a record on the types of masks they wore. Dr QUE explained to the Select Committee that the purpose of keeping such a record was simply to collect data for an epidemiological study of the causal relationship between the wearing of different types of masks and staff infection. There was no intention of controlling the supply of PPE or prohibiting HCWs from wearing N95 masks. Dr CHEUNG also told the Select Committee that once the hospital management was aware of the misunderstanding, he explained the purpose of Dr QUE's study to HCWs in staff forums held in TMH. There was no other concern expressed by HCWs about the provision of PPE.

12.16 Dr CHEUNG stressed that there was adequate supply of PPE during the SARS outbreak in Ward C8.

*Location for performing intubations*

12.17 The Select Committee noted from the statements of some witnesses that certain high risk procedures such as intubation, manual bagging[10], etc. had been performed in the SARS wards in TMH during the SARS epidemic. In the morning of 28 March 2003, a Senior Medical Officer of ICU, Dr Peggy TAN Yuen-heng, was requested to examine a SARS patient in Ward A5 for the purpose of transferring the patient to ICU. According to Dr TAN, when she arrived at Ward A5 at about 8:00 am, the patient was already breathing on BiPAP[11]. After examining the patient, Dr TAN intubated the patient in the Ward. The procedure was completed without any difficulty at about 8:30 am. While waiting to transfer the patient to ICU, Dr TAN performed manual bagging for the patient. When the bed in ICU was ready at about 10:00 am, the patient was transferred to ICU and arrived at ICU at about 10:15 am.

12.18 Dr TAN informed the Select Committee that manual bagging for the patient was performed by her most of the time. During this period of almost two hours, she asked a nurse around 8:40 am to perform the procedure for about five minutes when she had to make an entry in the case notes. She had also handed over the bagging procedure to another HCW in Ward A5, probably a doctor, at about 9:30 am for a period of 15 minutes when she called ICU to enquire whether the bed was ready. A doctor and a nurse in Ward A5 were later found to have contracted SARS and succumbed to the disease. Dr LEE and Dr TAN told the Select Committee that the bag used in the manual bagging procedure was fitted with bacterial-viral filters.

12.19 The Select Committee noted that there were occasions on which patients were intubated in the SARS wards before admission to ICU. After the setting up of a resuscitation team in TMH two years ago, intubations of patients were usually performed by ICU doctors. Dr LEE recalled that there were four occasions on which SARS patients were intubated in the SARS wards before admission to ICU, and that the intubations of SARS patients were performed by ICU doctors.

[10] Bagging is a procedure of using an Ambu bag to assist manually an intubated patient to breathe before the patient was put on the ventilator.

[11] BiPAP is the use of non-invasive positive pressure ventilation.

12.20 When asked by the Select Committee whether intubations of SARS patients must be performed in ICU, both Dr LEE and Dr CHOW said that there was no requirement that intubations of SARS patients must be performed in ICU. There were occasions on which intubations were performed in the SARS wards if it was clinically necessary to do so at the time. Nevertheless, intubations of SARS patients were performed by experienced ICU doctors, irrespective of the location of the patients. The Respiratory Consultant of the Department of Medicine and Geriatrics in TMH, Dr TAM Cheuk-yin, told the Select Committee that as far as he was aware, none of the infected HCWs had performed intubations on SARS patients.

12.21 Dr CHEUNG pointed out to the Select Committee that if the condition of a patient was deteriorating and intubation was envisaged, the patient concerned should be admitted to ICU as early as practicable so that intubation would be performed in ICU. Nevertheless, the need for intubation was based on a patient's clinical condition. If the patient's condition required immediate intubation, it would be performed immediately regardless of the location of the patient. Intubation would be performed by the most appropriate doctor available at the time.

12.22 The Select Committee noted from the information provided by the Convenor of the Central Committee on Infection Control (named the Task Force on Infection Control before 4 March 2003) and the Working Group on Severe Community-Acquired Pneumonia, Dr LIU Shao-haei, that intubation was classified as one of the high risk procedures in the HA Guidelines on SARS issued on 3 April 2003.

12.23 Dr TAM agreed that performing intubations on or manual bagging for SARS patients could have been the cause of infection of HCWs in TMH. Dr LEE, however, told the Select Committee that there was no direct causal relationship between the infection of HCWs and the manual bagging procedure.

12.24 Given that the physical environment and the infection control measures in SARS wards and ICU were essentially the same, and that the

intubations of SARS patients were performed by experienced ICU doctors, Dr QUE considered that the location for performing intubations on SARS patients should not be an issue in assessing the risk of infection of HCWs. Moreover, the cause of infection of the two HCWs in Ward A5 who passed away was still not known.

12.25 When questioned by the Select Committee as to why the intubated patient in Ward A5 had to wait for two hours before being transferred to ICU on 28 March 2003, Dr LEE explained to the Select Committee that all the 14 beds in ICU were occupied by non-SARS patients on that day. Given that there were non-SARS patients receiving treatment in TMH at that time, beds could not be left unoccupied. This would deprive non-SARS patients of their right to receive timely treatment in ICU. Before the admission of the SARS patient concerned in Ward A5 to ICU, some non-SARS patients whose conditions were improving had to be decanted to non-SARS wards in order to reduce the risk of cross-infection. Disinfection in ICU had to be carried out and the number of beds had to be reduced to 12 to allow more space between the beds.

12.26 Dr LEE told the Select Committee that the first SARS patient requiring ICU treatment was admitted to ICU on 28 March 2003, and that the highest number of SARS patients being treated in ICU was only nine. As there were eight doctors, 47 nurses and seven Health Care Assistants in ICU, the workload in ICU was not considered to be heavy.

12.27 Dr CHOW confirmed to the Select Committee that no suspected or confirmed SARS patient from the medical and geriatrics wards had been refused admission to ICU.

12.28 According to the evidence given to the Select Committee by the Chief Executive of HA, Dr William HO Shiu-wei, staff members of HA were notified vide his letter dated 17 March 2003 of the decision that individual hospitals should consider scaling down elective activities and, in particular, reserving enough ICU beds until the situation stabilized. Dr HO, however, admitted that emergency and essential services to the public must continue to be provided, including the ICU service.

12.29 When asked about the decision promulgated in Dr HO's letter of 17 March 2003, Dr CHEUNG informed the Select Committee that the New Territories West Cluster (NTWC) had taken measures to reduce non-urgent elective admissions and operations in order to correspondingly reduce the demand for the ICU service, in anticipation of the admission of SARS patients. In fact, these measures had been implemented before the opening of the SARS wards. However, emergency and essential services to patients with urgent conditions such as cancer had to be maintained. The need of these patients for ICU care could not be anticipated and such care had to be provided as and when the need arose.

Manpower resources

12.30 The Select Committee noted that some HCWs had reflected to the HA Review Panel on SARS Outbreak that the deployment of HCWs to work in the SARS wards was made by drawing lots. When questioned by the Select Committee, Dr CHOW explained that from the operational point of view, there was a need to draw up a duty roster for duties in the SARS wards so that the HCWs concerned could make plans for their own commitments. Lots were drawn for the purpose of allocating HCWs to the different shifts in the SARS wards and not for determining who would be "required" to work in the SARS wards. Doctors from the respiratory team were in fact placed at the top of the duty roster, followed by those who had volunteered to work in the SARS wards.

12.31 The Select Committee noted that some medical officers in TMH took annual leave during the SARS epidemic. In the course of the inquiry, the Select Committee noted that approval was given by Dr CHOW for the only Respiratory Consultant in TMH to take six days' annual leave in April 2003. As a result, the Consultant concerned was not on duty from 13 April to 23 April 2003. The Select Committee noted that TMH began to receive referrals of SARS patients from DMCs and AED in YCH starting from 12 April 2003.

## Analysis

Intubations of SARS patients in SARS wards

12.32 The Select Committee notes that although TMH was allowed more preparation time to receive SARS patients, and that more had been known about the disease by 26 March 2003 when TMH opened its first SARS ward, there were still 14 HCWs in TMH infected with SARS with two of them succumbing to the disease. The Select Committee has therefore looked into whether TMH had adopted adequate and effective infection control measures when treating SARS patients, and whether proper procedures had been followed by HCWs when performing intubations on SARS patients in TMH.

12.33 The Select Committee notes that TMH had taken adequate infection control measures when treating SARS patients. As far as intubations of SARS patients were concerned, the Select Committee has been told that there were a total of four occasions on which SARS patients were intubated in the SARS wards before admission to ICU. The Select Committee accepts Dr CHEUNG Wai-lun's explanation that the decision to perform intubation is a clinical one based on the patient's condition irrespective of where the patient is. Given the fact that the level of precautionary measures in SARS wards was the same as that in ICU, and that the four cases of intubation of SARS patients in SARS wards were performed by the ICU doctors, the Select Committee considers that it was not irregular to perform intubations in the SARS wards, as long as it was judged to be necessary from the clinical point of view.

12.34 The Select Committee cannot conclude that the infection of the two HCWs who died of SARS had been caused by performing manual bagging for the intubated SARS patient in Ward A5 on 28 March 2003, given that Dr Peggy TAN who performed the bagging procedure for most of the time was not infected. The Select Committee was told by Dr TAN that the same patient was already breathing on BiPAP before intubation. The Select Committee notes that according to the HA Guidelines on SARS, the use of BiPAP for suspected SARS patients was advised against from 3 April 2003 onwards. The guidelines also advised that if the use of BiPAP was deemed medically necessary, the procedure should only be performed with airborne precautions

such as performing it in a negative pressure isolation room and with the use of proper protective hoods. The Select Committee cannot, in the circumstances, conclude that the infection of the two HCWs was related to any specific treatment procedures.

Lead time for transferring the first SARS patient to the Intensive Care Unit

12.35 The Select Committee has examined why it took almost two hours before the intubated SARS patient was transferred from Ward A5 to ICU on 28 March 2003. The Select Committee has been told that all the 14 beds in ICU were occupied in the morning of 28 March 2003. When the request for a bed in ICU for the first SARS patient was received, ICU had to make the necessary preparation, including decanting patients, disinfecting ICU and improving bed spacing. The Select Committee finds these reasons acceptable.

12.36 The Select Committee has also considered whether ICU should have already decanted some of its patients whose conditions were improving when TMH opened its first SARS ward on 26 March 2003, so that ICU beds for SARS patients would be readily available. The Select Committee notes that Dr William HO, in his letter of 17 March 2003, asked HA hospitals to scale down elective activities and to reserve ICU beds for SARS patients. In response, TMH took measures to reduce non-urgent elective admissions and operations in order to reduce the demand for ICU service. TMH did not, however, reserve ICU beds to meet the possible demand from SARS patients. Dr CHEUNG pointed out to the Select Committee that emergency and essential services for patients with urgent conditions had to be maintained, and that the ICU service had to be provided as and when the patients had such a need.

12.37 Having regard to the fact that TMH was the only hospital providing ICU care in NTWC, the Select Committee appreciates the practical difficulties that TMH might have if ICU beds had to be reserved for SARS patients towards the end of March 2003.

## Performance and accountability

12.38 In the light of the relatively narrow focus of the Select Committee's inquiry into the outbreak at TMH, the Select Committee does not find any matters which warrant any comment on the performance or accountability of the senior management of TMH.