Report on designation of Princess Margaret Hospital (PMH) as SARS Hospital

Background

PMH was opened in 1976 as an acute general hospital. It provides secondary and tertiary services for the community in Kwai Tsing and Tsuen Wan districts of 1.5 million. For many years PMH is the only hospital with dedicated Infectious Diseases facilities in Hong Kong (HK). There are 4 isolation wards (2 for air-borne infections, and 2 for enteric/blood-borne infections) with a capacity of 86 beds.

2. On 26/3/03, Hospital Chief Executive (HCE) of United Christian Hospital (UCH) reported Amoy Gardens outbreak to Hospital Authority Head Office (HAHO) and Department of Health (DH). On the same day, at Health, Welfare & Food Bureau's (HWFB) 5th Task Force Meeting, Director of Health recommended a basket of public health measures, including designation of PMH to receive new SARS patients. In view of Government's plan to set up Designated Medical Centres (DMCs) for the detection of early cases in the community, Cluster Chief Executive, Kowloon West Cluster (CCE, KWC) was requested to explore the capacity of PMH to receive all SARS patients referred from DMCs of DH and Accident & Emergency (A&E) Departments of other hospitals in HK. Prior to that, around 100 SARS patients had already been treated in PMH. The decision to designated PMH as the SARS receiving hospital at that stage was based on its dedicated infectious disease facilities, its past experience in treating infectious diseases as well as the fact that there was no staff infection in PMH up to that moment. In the afternoon of 27/3, Chief Executive of Hong Kong Special Administrative Region announced measures to combat SARS in HK, including the designation of PMH as a SARS receiving hospital.

Preparation to be a SARS receiving Hospital

3. To prepare for this major undertaking, immediate meeting was arranged with all HCEs of Kowloon West Cluster (KWC), and then with all Unit Heads at PMH. HAHO and other clusters pledged full support to PMH and KWC. The agreed plan was:

(i) vacate all existing PMH non-SARS services
(ii) make provision for 912 acute SARS beds
- 720 adult beds – 120 admission beds, 600 SARS beds

- 118 Paediatric & Adolescent beds
- 64 adult Intensive Care Unit (ICU), 10 Neonatal ICU/Paediatric ICU (NICU/PICU)

(ii) vacate the entire TWGHs Wong Tai Sin Hospital (WTSH) to provide 400 SARS convalescent beds

Preparation of PMH and WTSH

4. Details of preparing PMH for this mission are:

(i) Convert all general wards in ABCD and EF Blocks to be SARS wards
(ii) Designate wards ABCD 2 to be ICUs
(iii) P Block to be clean wards for renal patients
(iv) Stop emergency Medicine & Geriatrics (M&G) admissions from 27/3 to reduce patient load
(v) Stop all elective surgical operations and day procedures
(vi) Stop all new case booking for Specialist Outpatient Clinic (SOPC)
(vii) Decant all non-SARS patients including Infectious Disease, NICU, M&G, Surgical, Orthopaedics & Traumatology, Obstetrics and Gynaecology patients to other hospitals in KWC and Queen Elizabeth Hospital
(viii) Supporting services and logistics support eg ventilation improvement (installing exhaust fans by Electrical & Mechanical Services Department (EMSD) to create negative pressure), quarters for staff, staff changing and showering facilities, linen and laundry, medical equipment, Personal Protective Equipment (PPE), and cleansing and waste management

5. Similar efforts were spent to prepare WTSH:

(i) Discharge/Transfer all existing TB & Chest, rehabilitation, convalescent, infirmary and hospice patients to other clusters.
(ii) Closure of Geriatric Day Hospital and TB& Chest Specialist Outpatient service
(iii) Set up Infection control systems.
(iv) Undertake appropriate renovation works to improve ventilation and physical facilities.
(v) Similar supporting services and logistics support.

Staff Communication

6. Several staff forums with CCE (27/3, 28/3, 29/3, 2/4, 9/4) were conducted, which

were video-conferenced to all KWC hospitals to get everybody involved. Chairman of Hospital Authority was present at the 27/3 Forum to show support and endorsement. Secretary for Health, Welfare & Food was present on the 2/4 Forum to boost staff morale. CE of HA appeared on the 9/4 Forum via video conferencing to meet the staff. For WTSH, there were 2 staff forums with HCE on 28/3/03 and 4/4/03.

Decanting

7. On 29 March 00:00, PMH closed A&E. At 09:00, PMH started admitting all SARS patients referred from DMCs and A&E Departments. The original plan was to decant the department one by one to be completed in around one week. However, due to the unexpectedly high number of SARS patients admitted during the first few days (268 patients in 3 days), the decanting was speeded up and completed by 31/3/03.

Ward Preparation

8. To improve ventilation, exhaust fans were installed in all SARS wards and ICU. Beds were spaced out with 3 feet in between. Clean and dirty zones were identified. Treatment rooms and interview rooms were converted into gowning and staff rest rooms. Special trolleys were set up for PPE and disinfecting hand rubs. A set of medical equipment was designated for each cubicle and all patient records put outside to avoid cross contamination. Patrol staff were deployed at ward entrance to ensure proper use and removal of PPE. Frequency of cleansing and floor mopping were increased. Designated staff for frequent toilet cleaning was introduced at a later stage. Warning signs and posters were put up to alert staff. A video on infection control practice was shown continuously in staff canteen to remind staff. It was also used for training of staff on infection control practices.

Manpower Deployment and Training

9. Most nurses and doctors and all administrative staff remained in PMH to fight for SARS. Training / experience profile of all staff was drawn up to facilitate deployment, particularly into ICU and SARS wards. Pregnant staff were transferred out of PMH to low risk areas. Clinical teams, working groups and infection control team were formed. Special training were organized for all grades of staff:

(i) Demonstration on the use of PPE in Community Health Resource Centre
(ii) Infection control talks by Central Nursing Division
(iii) On-site infection control briefs by Infection Control Nurse
(iv) Crash course on ICU care for non ICU nurses

(v) Orientation of medical and nursing staff

(vi) Workshops for doctors on SARS management, ICU care and resuscitation

10. Facing the SARS crisis, HAHO has emphasized to all staff that every staff would need to be prepared for deployment outside their existing areas where necessary. Since 3/4/03, a total of 61 staff including Chiefs of Service (COSs), consultants, frontline doctors, nurses and executives had been deployed to PMH from other hospitals. 43 of them were from KWC and 18 from other clusters. Another 18 staff from other hospitals volunteered to join PMH during this period.

SARS Management Committee

11. KWC SARS Management Committee functioned effectively through daily meeting with all the senior managers in PMH and linked through video conferencing with HCEs of KWC to set directions and resolve issues. Manpower deployment within KWC was facilitated.

SARS Control Centre

12. SARS Data Control Centre started operation since 31/3/03 alongside with the DH's NTW surveillance team. The SARS registry captured patient data for central case reporting and contact tracing. All SARS reports were generated through the SARS database set up by Information Technology Department of PMH, which evolved into the on-line e-SARS system to facilitate central coordination and communication. Daily reports were generated for admission/discharge statistics of patients and affected Health Care Workers (HCW). Functions of the Control Centre are summarized as follows:

(i) Act as central coordinating center to monitor and control all SARS patient information

(ii) Liaise with SARS wards, HA SARS Centre, DH to ensure efficient flow of information

(iii) Provide all assistance to DH and HAHO to facilitate contact tracing and reporting

(iv) Maintain SARS case registry and update of the e-SARS system

(v) Prepare daily SARS reports to CCE (KWC) and HAHO

(vi) Formulate statistical reports for SARS patients

(vii) Provide data to concerned parties for clinical review, research and report writing

(viii) Keep track of suspected cases and early identification of outbreaks

PMH as the Designated SARS Hospital – 29 March till 11 April

13. On 29/3/03 00:00, PMH closed A&E service. On 29/3/03 09:00, PMH started admitting all SARS patients referred from all A&E departments, 4 DMCs of DH and private hospitals. Referral guidelines were issued to relevant parties. On the first day when non-SARS PMH patients were still being transferred out to other hospitals, 93 SARS patients were admitted. The number of admissions in the immediate few days after designation is as follows:

1st week daily new SARS admissions:

29/3	30/3	31/3	1/4	2/4	3/4	4/4	5/4	Total
93	62	113	87	72	68	60	41	596

14. Many of the newly admitted patients were relatively ill. They rapidly deteriorated and required ICU care. Significant increase of ICU patients in a short time span had required urgent deployment and staff reinforcement beyond the original plan.

ICU: Ward arrangement and staff deployment

15. To cope with the rapid increase in number of SARS patients requiring intensive care, the number of ICU wards was increased from 1 to 3. Nurses from Operation Theatre, Coronary Care Unit, High Dependency Unit and Respiratory ward of PMH were deployed to ICU. HAHO deployed 39 nurses with ICU experience from other clusters/hospitals to PMH. Nurses were deployed on ward basis to minimize cross-ward movement. Staff's working hours were re-scheduled to minimize the frequency of staff movement. In the allocation of PPE, priority was given to ICU. Engineers from HAHO, EMSD and Environmental Protection Department visited ICU/PMH to work on improvement of air quality and working environment.

16. Significant help was also offered by other ICUs and hospitals of HA. Totally 19 doctors (including 4 consultants), 39 ICU nurses, as well as 2 executives (1 HCE and 1 General Manager (Nursing)) were deployed in. Apart from direct patient care, the critical priorities were setting up a good infection control system, internal communication and staff support.

Staff Infection

17. Facing high concentration of SARS patients and workload pressure, a significant number of ICU staff was infected with SARS. The first ICU doctor fell ill on 1/4/03, with

a peak of 12 affected staff on 7/4/03. A total of 23 ICU staff got infected, including the COS and 3 other doctors. Whilst additional manpower was deployed into ICU, there were concerns about effectiveness of infection control measure in the face of high patient concentration. With gradual stabilization of ICU's management structure, effective infection control measures as well as arrangements by HAHO to decrease the number of ICU patients in PMH, staff infection rate dropped. There was no more ICU staff infected after 14/4/03, 2 weeks after rapid expansion of the ICU. A total of 62 HCW were affected in PMH, with 23 from ICU. The last ICU staff affected was on 14/4/03. The last HCW affected in PMH was on 10/5/03.

Equipment & Medical Supplies Set Up in ICU

18. Timely acquisition of all essential equipment and medical supplies had been made. ICU started preparation since mid-March 2003. A total of 14 sets of Servo ventilator, 20 sets of physiologic monitor and 12 sets of volumetric infusion pump were being deployed from other hospitals within PMH. Adequate ventilators were provided to ICU. Anaesthetic machines were ready to be used as the last resort. Scavenging system had been installed to de-gas evacuation port of all ventilators. Bacterial/viral filters were fitted to all ventilators and ambu bags. Endotracheal aspiration was done with closed suction catheter. Tympanic thermometers were used for temperature taking.

Reaching the Limit

19. The unexpected upsurge in the number of SARS patients, mainly as a result of Amoy outbreak, had stretched the capacity of PMH to a limit. On 7/4/03, PMH started to transfer SARS convalescent patients to WTSH. On the same day, HAHO also decided to confine admission of new SARS patients to PMH only from DMCs. On 11/4/03, HAHO decided to stop admitting any further new SARS patients to PMH. In parallel, PMH transferred potential ICU patients to other hospitals eg Queen Mary Hospital, Pamela Youde Nethersole Eastern Hospital and Tuen Mun Hospital. These efforts greatly relieved the tension in the ICU. PMH could then stabilize and concentrate on managing the 400 odd confirmed SARS patients who were still staying in the hospital.

Conclusion

20. PMH, particularly its ICU, has taken up a very significant workload of SARS patients in a relatively short duration. Unexpected admission of too many patients too soon had stretched PMH beyond its capacity, especially over manpower and expertise. The pressure was highest in ICU when these newly admitted patients were relatively ill. High concentration of critically ill patients also incurred substantial risk of staff infection.

Through intra- and inter-hospital staff deployment, transferring potential ICU patients to other clusters and stopping further admission, PMH gradually resumed to function effectively.