



**Infection Control Measures Taken
by the Hospital Authority
In the Management and Prevention of
the SARS Incident**

HA SARS 10/03

24 June 2003

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BACKGROUND

The epidemic of SARS began in Hong Kong in late February 2003 when the first patient was admitted to Kwong Wah Hospital. Prior to this, there were several press reports on outbreaks of atypical pneumonia in Guangdong Province. These reports served to remind HA of the potential threat of infectious disease and on 11 February, a Working Group (Group) on Severe Community Acquired Pneumonia (CAP), comprising experts from clinical microbiology, internal medicine, intensive care, respiratory medicine, and executives, was formed. The Group was tasked to advise HA on the surveillance and management of severe CAP.

2. The surveillance system established is part of the HA action plans for the management of communicable diseases and presentation of hospital acquired infection. A flow chart in managing infectious diseases of public concern is attached in appendix I.

3. Together with the HA Central Committee on Infection Control, the Group has held 7 joint meetings between 11 February to 18 March 2003. Infection control strategies were discussed and proposed for adoption on a HA-wide basis. Besides, a series of guidelines and documents of Frequently Asked Questions (FAQ) on infection control, management and reporting of severe CAP was issued to build in the framework for the surveillance and management of the disease. More than 20 communication forums have been held in hospitals to heighten the awareness of front-line colleagues to the epidemiology of this new disease and the importance of personal protection when attending to patients suspected of contracting severe CAP (later renamed as SARS).

STRATEGIES IN INFECTION CONTROL ON SARS

4. In general, six Key Strategies have been adopted as far as infection control of SARS is concerned

Providing A Safe Environment

5. Within hospitals, confirmed or suspected SARS patients are to be isolated and cohorted in designated units with barrier nursing and sufficient physical spaces provided. Clinical areas were further stratified into different risk zones based on an assessment of the level of risk of infection having regard to the physical environment, patients attended and procedures involved. Corresponding precautionary measures were implemented. The environment and equipment

were frequently disinfected and duly upgraded. Physical settings were altered based on the latest knowledge of the disease.

6. Ideally, patients should be placed in single isolation rooms with negative pressure. However, as this may not be possible for all cases, such facilities were reserved for patients who require high-risk procedures and for those with a high index of suspicion for the disease. Having said that, with the assistance of engineers and other technical staff, efforts have been directed to assess the ventilation system of the ward environment in a bid to improve the air exchange and air quality. Wherever required, additional exhaust fans and filtering equipment were installed. In view of the key significance of environmental factors in the effective management of infectious diseases, HA is working together with governmental partners, including the Electrical and Mechanical Services Department (EMSD) and the Environmental Protection Department (EPD), in continuously improving the ventilation system of clinical areas in hospitals, including the setting up of more negative pressure rooms in each acute general hospital. As at 9 June 2003, improvement works have been undertaken in 24 hospitals.

Enforcing Infection Control Measures

7. Infection control enforcement: Efforts were focused on enforcing implementation of SARS precaution measures at all levels. In addition to the works by hospitals' Infection Control Teams (ICTs), a hierarchical network with representatives from all HA hospitals was set up in the second week of April, spanning across the Head Office, hospital management, all departments and individual workplaces. Members at different levels of the hierarchy provide links of communication and were empowered to supervise effective implementation of SARS precaution measures in accordance with HA policy. A warden was designated in each work shift to take charge of infection control enforcement at the workplace level.

8. Identify and segregate patients: Prompt identification and isolation of patients with SARS is another important infection control measure. As patients with SARS may not present with typical symptoms on the outset, knowledge sharing and awareness training to heighten clinician's vigilance in the recognition and clinical management of atypical "cryptic" cases have contributed to the effective prevention of spread of the disease in hospitals. Once cases are identified and triaged accordingly, they are to be placed in appropriate clinical areas stratified into different risk zones with the corresponding level of protective equipment for health care workers.

9. Mandatory training: The HA Head Office (HAHO) required all hospitals to provide mandatory training to staff including contractor staff before end of April, and thereafter receive further refresher training as and when necessary. The Public Affairs and Human Resources Sections of HO have produced posters and multi-media training resources to facilitate communication and training in hospitals. Apart from hospital-based training, the HO has also organized 26

infection control training sessions to hospital staff in particular the supporting staff from April 24 to June 19.

10. **Monitoring and audit:** On April 26, 2003, HAHO organised a meeting with the Infection Control Officers (ICOs) and Infection Control Nurses (ICNs) to discuss the monitoring of compliance and effectiveness of the SARS precaution program through structured inspection of all workplaces. Depending on the progress of work and available expertise in different hospitals, the Hospital Infection Control Teams (ICTs) in hospitals were to conduct audit on their own or HAHO would organize independent inspection. At the same time, members of the HA Board and senior executives of HAHO have also paid visits to hospitals to appraise of the management systems and measures related to infection control. By fostering a partnership with Hospital ICTs and with clear understanding of responsibility, an overall framework for feedback and reinforcement of infection control measures compliance for SARS was set up.

11. The inspection exercise is not a conventional audit exercise, but rather to help speed up culture change and feed information to the hospital ICTs and HAHO so that together, they could respond swiftly to possible deficiencies.

Communicating Messages Effectively

12. Making use of the email technology, there has been a close communication network built up between ICTs and Secretariat of Central Committee on Infection Control (CCIC). Apart from guidelines promulgation, materials relevant to the tasks of infection control have been circulated to ICTs for information. In addition, these materials have further been posted onto the HA intranet under the page of Clinical Manuals/Guidelines – Infectious Disease. The HA website also support discussion forum on e-mail for colleagues to share and enquire on their experience of infection control enforcement.

13. Apart from the use of IT, HAHO published a daily newsletter “Battling SARS Update” to disseminate essential infection control messages. In addition, a 24-hour “SARS Hotline” was established to improve communication with the front-line and provide immediate response to SARS-related problems.

14. At the hospital level, infection control wardens have been designated to remind front-line colleagues of the importance of good infection control practices and proper utilization of personal protection gears when attending to SARS patients. Regular hospital forums were conducted to update staff member of the development and evolution of the outbreak scenario of the Hospital and the overall picture, as well as to collect direct feedback and address to local operational issues. Hospital-based infection control resource centres were also piloted.

Controlling Outbreaks and Investigating Breakthrough Infections

15. To prevent and control outbreaks in hospitals, measures for control of people flow are important. Restrictions on visiting were imposed on 24 March 03 for HA hospitals in general (8 March 03 for Prince of Wales Hospital) and patient movement was limited, especially for those wards admitting SARS patients and general medical patients. On 3 April 2003, the "no visiting policy" to all acute wards was enforced to further strengthen the control of people flow in hospitals.

16. For outbreaks in non-SARS ward, immediate actions were taken by hospitals to identify the index patients in the ward and to initiate actions for contact tracing and cohorting of contacts in appropriate areas so that the outbreak is contained. Onsite investigations would be carried out by hospitals to find out more about the circumstances leading to the outbreaks and where there were valuable lessons to learn from the outbreaks, such messages were disseminated to staff and hospitals through updating the guidelines on management of SARS and the "Battling SARS Update"

17. Studies on the circumstances leading to staff infections are essential for the prevention of future outbreaks. In addition to investigation by Hospital Infection Control Teams, HAHO has coordinated additional studies and reviews on staff infections; based on standardised reporting format or targeted at high-risk procedures. Information involving health care workers was analysed and common patterns and risk-associated factors were identified so that recommendations could be made and generalised for use in all hospitals.

Heightening Vigilance to Potential Patients and Staff's Own Health

18. Hospitals were alerted to enhance precautions for possible "cryptic cases" in newly admitted cases through forums and publications. Senior physicians and physicians experienced in managing SARS patients were tasked to make dedicated efforts in assessing admitted patients in an attempt to identify suspected SARS patients as early as possible. As for staff, periodic extra day-offs were granted and their work shift was re-scheduled in a bid to reduce staff fatigue and augment attention span. The manpower in SARS wards was also strengthened. Surveillance of staff for fever and development of symptoms was heightened and to facilitate staff to keep a daily log of their own body temperature, thermometers were distributed to staff.

Protecting Staff with Appropriate Personal Protective Equipment (PPE)

19. Standard provisions of personal protective gears were defined having regard to the latest knowledge of mode of transmission of the virus and local experience of breakthrough infections. Clinical areas were risk-stratified based on the level of risks of exposure. The Expert Group on Infection Control conducted assessments on the different types of PPE, discussed the pros and cons of the various provisions and recommendations were made and regularly updated and disseminated via the SARS web-page in the HA intra- and inter-net.

20. Apart from setting standards for PPE to be worn in different clinical areas according to the risk so stratified, training on the appropriate use of PPE is of equal importance. The Expert Group on Infection Control on SARS has also made recommendations for their use and assist in developing training sessions for use of PPE. Input has also been provided to colleagues in the supplies department so as to ensure that the appropriate PPEs were purchased and stocked. Message on appropriate use of PPEs were reinforced through the "Battling SARS Update".

INFECTION CONTROL OF SARS in HA hospitals

21. As various hospitals were involved in managing SARS outbreak, there has been an extension of efforts from local infection control in hospital to the development of a HA-wide centrally coordinated infection control system of SARS.

22. In response to the alert to heightened surveillance of Severe Community Acquired Pneumonia (CAP) in February, the Working Group initiated a look back study to gather background information on Severe CAP as well as a prospective surveillance with the first case definition to generate scientific data for ascertaining whether there was a genuine increase of Severe CAP. The exercise also aimed at identifying the pathogens involved with laboratory network and collaboration. Attention was drawn to the subject by issuing "Frequently Asked Questions on Severe CAP" alerting all staff on its infectivity, case reporting mechanism, arrangement on laboratory testing, infection control measures, use of personal protective equipment and treatment options. Seminars and briefing sessions were conducted. The Department of Health was involved in early case tracing. The actions undertaken at this very early stage involve specialists of various disciplines and heighten awareness among staff contributed to the following important milestones:

1. identification of a cohort of H5N1 avian influenza among family members visiting Fujian in February 2003
2. initiation of a more vigorous diagnostic approach, with open lung biopsy performed on one of the index patients on 4 March, eventually led to the successful isolation of SARS-Coronavirus
3. introduction of a network of simultaneous identification and visualization of the aetiological agent at four laboratories, namely, Government Virology Unit of Department of Health; Microbiology laboratories in QMH, QEH and PYNEH
4. delineation of the linkage of cases responsible for the subsequent outbreaks through the case reporting mechanism giving rise to list of Severe CAP patients for contact tracing

23. Based on the pre-existing within-hospital infection control infrastructure, the hospital Infection Control Teams implemented their local measures on containment of infections. The expert group formulated HA guidelines on SARS for dissemination and posting onto HA intranet on 19 March 2003 covering

infection control measures in particular those for high-risk procedures including aerosol generating procedures. Case definition was updated and reporting procedure unified to improve monitoring of incidence of infection. Seminars on infection control were organized in cluster hospitals.

24. The Head Office Infection Control Team and HA engineers visited various hospitals during end March and April to perform system review and made suggestions to hospital management on improvement initiatives. Visiting to SARS patients and later to all patients in acute hospitals were restricted. The Infection Control Enforcement Network was set up to better coordinate experience sharing and implementation of infection control measures. SARS precaution guidelines were updated to cover broader scopes such as risk-stratified use of personal protective equipment, post-discharge care, post-mortem examination as well as laboratory safety with bilingual versions of guidance notes for patients included.

25. Experience gained from an official visit to Guangdong hospitals from 17-18 April 2003 was shared with colleagues. Measures were further discussed in the Advisory Group on Facilities, Equipment and PPE. A hierarchy of infection control wardens was initiated through Infection Control Enforcement Network to enforce SARS precautions in hospitals:

25.1 Head Office – the Head Office Infection Control Team:-

- a. work with the expert group and other disciplines in updating various SARS precaution guidelines;
- b. liaise with the Head Office Command Centres (on policy formulation etc) and Business Support Services (on PPE supply); and
- c. collaborate with Public Affairs Division in producing promoting materials such as posters and training video and SARS newsletter

25.2 Hospital / Cluster – Infection Control coordinators:

- a. reinforce existing infection control mechanism,
- b. liaise with HO and hospital management,
- c. enforce training

25.3 Department – designated Infection Control coordinators –

- a. plan and supervise Infection Control training and precautions

25.4 Workplace – wardens (designated for each work shift):-

- a. take care of all infection control matters at workplace such as PPE acquisition & distribution, stock management; maintenance of reusable PPE;

- b. perform infection control briefing & updates;
- c. assure good practices among health care workers in particular supporting and contractor staff; and
- d. liaise with the departmental / hospital Infection Control Coordinators

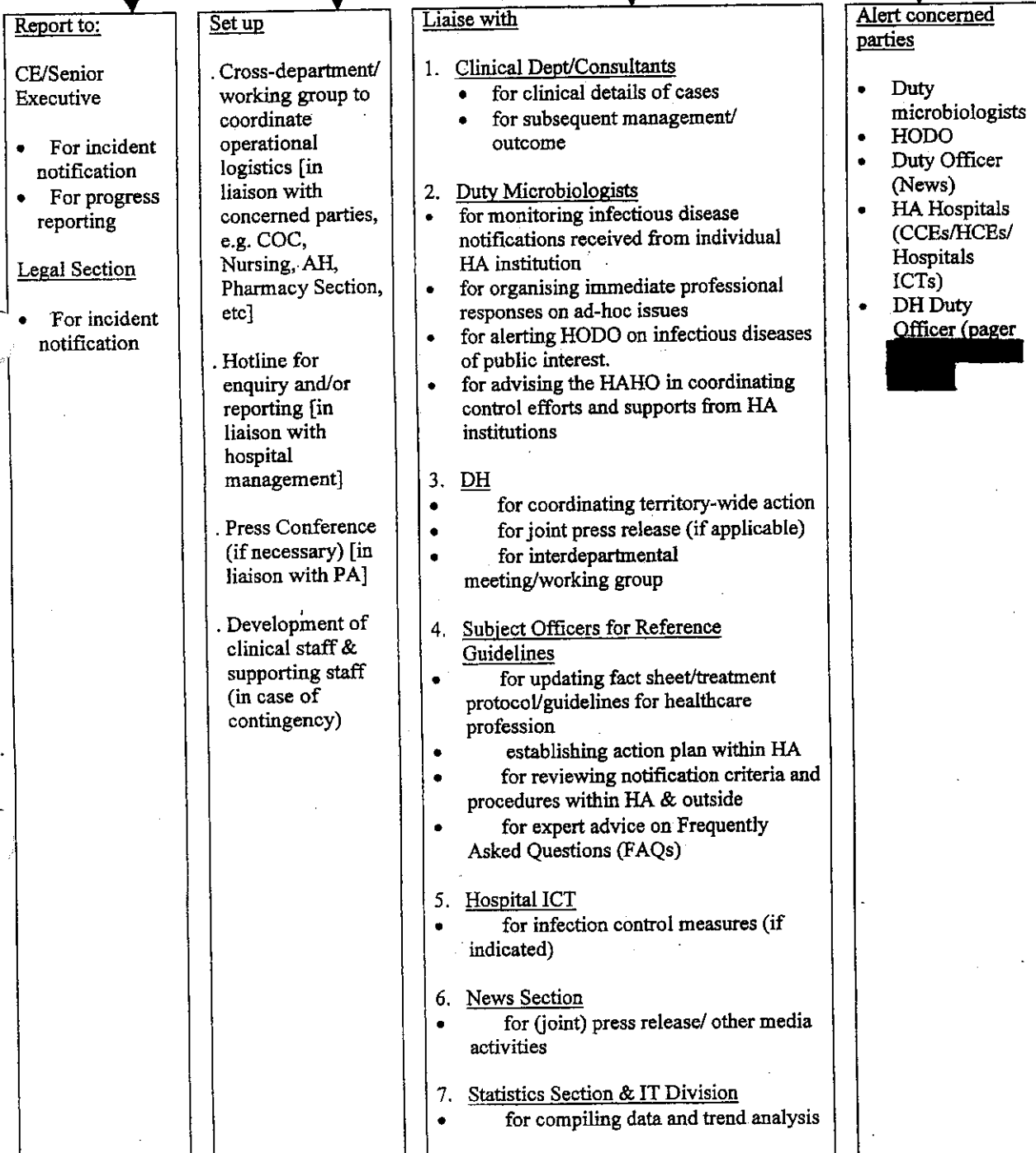
26. To further focus on the various key areas of work related to SARS, the HA Board has assigned 3 task forces on (1) infection control, (2) clinical management and informatics, and (3) supplies and environmental control. The Central Task Force on Infection Control headed by a Director was responsible for coordinating activities in outbreak control, auditing/inspection of practices, communication, and analysis of breakthrough infections. A staff infection review was initiated. The review was based on written reports and experience shared by ICOs, survey questionnaire on probable contributing causes, staff infection statistics and random site inspections in a number of hospitals was carried out. Experience from the review was communicated through news letters and shared among ICOs & ICNs and managers of various grades. Besides, the result of a multi-hospital study on effectiveness of precautions against SARS published in the *Lancet* on 3 May highlighted the effectiveness of standard provisions of personal protective gears against infection. The organization of Central Task Force on infection control was consolidated as in Appendix 2.

27. Despite the effective measure taken by hospitals and the community in bringing down the number of new confirmed cases of SARS, the possibility of re-occurrence of SARS should not be under-estimated. The need for continual vigilance in hospital infection control measures and personal and environmental hygiene in the community are to be emphasized, with experience elsewhere on re-occurrence of SARS cases well learnt. Researches and discussions on cases tracing and improved testing methodology have also been embarked on to better prepare the Government and hospitals for effective surveillance and management of patients of infectious diseases. Planning works have also commenced to ensure that hospital facilities are appropriate and adequate for the management of possible future outbreak of infectious diseases.

Flow chart for Infectious Disease of Public Concern

Report from Hospital/ Duty Microbiologists/ News Section

Subject Officer/Secretary of TFIC

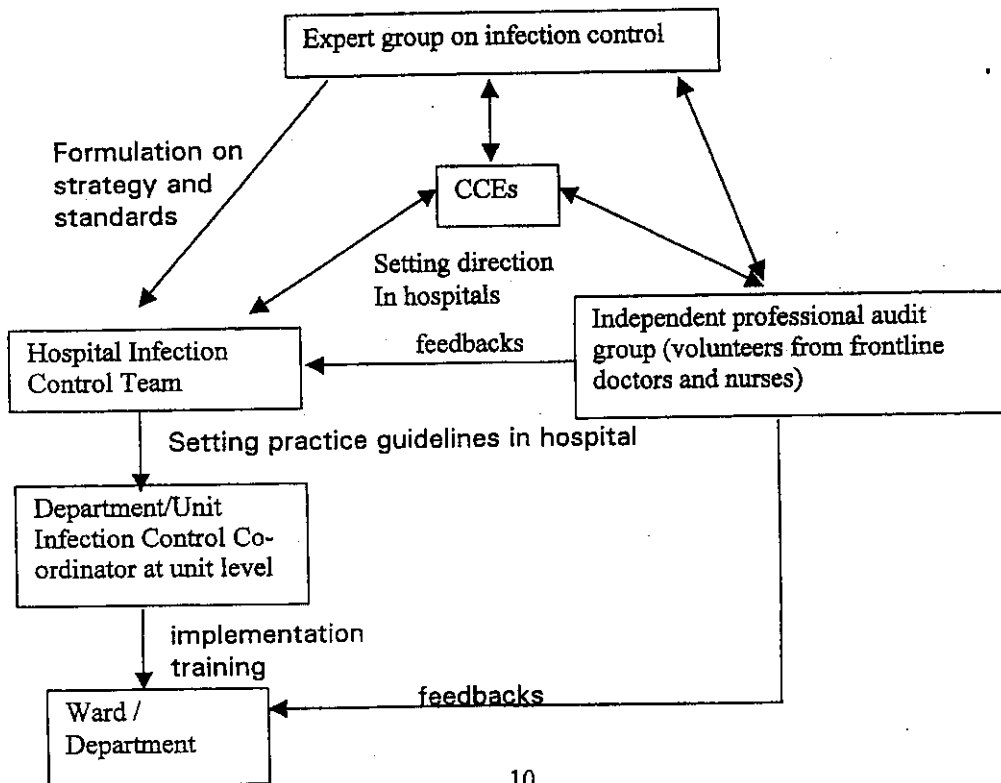


Organization of Central Task Force on Infection Control on SARS

1. **Expert group on infection control on SARS**
 - Formation of strategy and standards.
 - Make recommendations for improvement, taking into consideration recommendations by authorities and local experience.

2. **Independent audit group**
 - Formation of systematic standards and models for auditing compliance of infection control.
 - Regular surprise audits with frontline staff as coordinators/volunteers.
 - Feedback of observations to:
 - a) Hospital Infection Control Teams.
 - b) Regular staff communication, e.g. forums, newsletter.
 - c) Expert group on infection control.

3. **Outbreak control and investigations of breakthrough infections**
 - Active involvement in outbreaks investigations in communities and hospital breakthrough infections involving more than 2 HCWs.
 - Involvement and central coordination of analysis of hospital acquired infection in HCW with "lessons to learn".



Corrigendum

SARS EC 20/03/1

Please replace paragraph 15 with the following:

To prevent and control outbreaks in hospitals, measures for control of people flow are important. Restrictions on visiting to cohort wards and SARS wards were imposed on 27 March 03 for HA hospitals (11 March 03 for ward 8A at Prince of Wales Hospital). Patient movement was limited, especially for those wards admitting SARS patients. On 3 April 2003, the "no visiting policy" to all acute wards was enforced to further strengthen the control of people flow in hospitals.