1. **Title**
   Control of Transmission of Tuberculosis in the Healthcare Settings in the Hospital Authority

2. **Scope**
   It covers infection control measures including ventilation-engineering principles and guide for respiratory isolation as well as precautionary measures for healthcare workers and patients. It also touches upon the subject area of management of contacts.

3. **Introduction**
   Tuberculosis (TB) is a common infection in Hong Kong. There are 7000 to 8000 cases of TB notified each year, among which most are of pulmonary origin. A high index of clinical suspicion, early treatment and prompt isolation of infectious cases are warranted.

4. **Transmission**
   TB is contagious. It is readily transmitted by the airborne route. An infectious dose can be low. Transmission is especially likely in the cases of active pulmonary or pharyngeal TB who are smear positive. It is unlikely for transmission to occur in cases of extra-pulmonary TB (e.g., spinal TB, TB meningitis).

5. **Control of Transmission of TB in the local healthcare settings**
   There are overseas guidelines on the control of transmission of TB. A number of the covered areas are based on theoretical considerations and expert opinion. However, solid evidences may not be readily available. With a different epidemiology and larger number of TB patients requiring hospitalization, there are concerns on the applicability, practicality, and cost-effectiveness of implementation in the local settings.

6. **Infection Control Measures**

   6.1 It cannot be over-emphasised that medical staff should be alert of early diagnosis and treatment of patients with active TB. Currently, smear microscopy on properly collected sputum specimen is still the most cost-effective way for rapidly diagnosing infectious TB.

   6.2 Patients suspected or confirmed to have active infectious TB should be managed in designated TB isolation wards/rooms. The simplest and most cost-effective ventilation design is by “maximizing natural ventilation through open windows”, as stated by WHO. However, this has to be balanced against the comfort related to temperature and humidity. Mechanical ventilation with unidirectional flow is acceptable, but is inferior to stringent negative pressure ventilation with non-recirculated fresh air from outside. The latter, however, is clearly much more costly. The design of the healthcare facility, climate of the area, type of population served, number of TB patients cared for in the facility will influence the consideration of measures of environmental control. In summary, some ventilation-engineering principles for consideration are:

   i. The TB isolation ward/room has a ventilation system that can achieve not less than 6 air changes per hour. (In newly designed units, preferably this should not be less than 12 air changes per hour.)
   ii. The room is under negative pressure with reference to neighbouring areas.
   iii. The air exhausted from the room is not recirculated. If recirculation of air is necessary, it should pass through a High Efficiency Particulate Air (HEPA) filter.
   iv. Regular technical maintenance of isolation facilities is important.

   6.3 Individual hospitals should review the adequacy of available respiratory isolation facilities. A general guide for respiratory isolation is as follows:

   i. In general, patients with active infectious pulmonary TB are to be placed in an appropriate TB isolation room/ward for at least 2 weeks after commencement of effective anti-TB therapy.
   ii. A TB patient should not be placed in the same general ward with HIV / other
immunocompromised patients unless he / she has at least three negative smears for acid-fast bacilli (AFB) on separate occasions over at least a 14 day period.

iii. For patients with known / suspected multi-drug resistant TB (MDR-TB), isolate until smear conversion (as above).

iv. For hospitals managing large number of TB patients, stringent isolation under ideal settings may not be practicable. Cohort isolation in different compartments / sections of naturally well-ventilated wards is an acceptable alternative.

v. The set-up of the mycobacteriology laboratory and conduction of procedures therein should be in accordance with specific requirements for infection control.

7. **Staff Precautions**

The followings are recommended:

a) Education of staff on different aspects of disease, use of guidelines, and symptom-motivated screening should be carried out to enhance personal infection control.

b) Effective surveillance of active TB among health-care staff is particularly important locally because the use of tuberculin test is limited by the high background tuberculin-positive rate. All cases of Tuberculosis need to be reported to DH in accordance to HAHO Operations Circular No. 13/2001. Apart from this, if the employees have contracted TB, the cases will need to be notified to the Labour Department, in accordance to the memos issued by HAHO to all HCEs dated 29 June 1998 and 24 July 1998 under the subject “Occupational Safety and Health Ordinance (‘Ordinance’) 1) Notification of Occupational Diseases by Medical Practitioners; and 2) Inquiry into Workplace Accident/Dangerous Occurrence by the Labour Department”.

c) The use of N95 mask is strongly recommended when healthcare workers are performing cough inducing and other high risk procedures (such as sputum induction endotracheal intubation and bronchoscopy) in known or strongly suspected TB patients. A properly worn surgical mask may be an alternative if the patient is already on effective chemotherapy and improving.

d) Wear gloves when handling infectious materials, e.g. sputum.

e) Under special high-risk circumstances, health care staff who have never received Bacillus Calmette-Guerin (BCG) before could be tested with a tuberculin test, and if negative, given BCG vaccination after staff counselling. Account should be taken of the likely risk of exposure to TB particularly MDR-TB, possible roles of tuberculin surveillance and chemoprophylaxis among these tuberculin-negative unvaccinated subjects. Informed choice is the preferred approach.

8. **Patient Precautions**

The followings are recommended:

a) Health education should be provided for patients including the need to observe personal hygiene. One should cover his / her mouth when coughing. Sputum should be collected in tissue paper and disposed by adequate flushing in the toilet. Hands should be thoroughly washed after handling of sputum.

b) Infectious TB patients (especially those with uncontrollable cough) utilizing common investigation facilities outside the TB isolation ward / room (e.g., Radiology department and Electro-diagnostic department) should wear surgical masks to reduce the production of airborne droplets.

9. **Management of Contacts**

The management of contacts is as follows:

a) In most cases, contact examination only plays a supplementary role in the control of TB within health care settings.

b) No single rule is likely to apply to the diversified clinical settings. A case-by-case assessment of the likely risk and the potential yield of the screening investigation is required to decide on the necessity and extent of such examination.

c) In general, contact examination may be considered for persons who have been in
close and prolonged contact with highly infectious TB patients (e.g. untreated patients who are smear strongly positive). Other contacts with suspicious symptoms and signs should also be examined. Special consideration may also be given to highly vulnerable patients with lesser degree of contact. Chest X-ray is commonly employed when contact examination is indicated (i.e. after taking into account of the history of exposure and whether there are any symptoms and signs of active TB infection in the contacted person).

d) There may be a need to compile a contact list for mass contact examination under special circumstances, e.g. outbreaks with clustering of TB in time / space.

e) Certain groups of close contacts, like the immunocompromised or the very young (e.g., age < 2), may benefit from chemoprophylaxis.

f) Tuberculin testing may also give useful information in certain situations, especially in relation to young children and chemoprophylaxis. Health education should also be provided to contacts to promote early awareness of symptoms. Any staff members who attend the patients in a routine manner are not at special risk.

g) The precise roles of tuberculin test, BCG and chemoprophylaxis in the routine management of contacts are still highly controversial in the local settings. Extensive use of tuberculin test may not be indicated even among high risk hospital staff in view of the high background positive rate. In many situations, only a case-by-case decision with informed choice is possible.

h) The Infection Control Team of the respective hospital should be consulted any outbreak investigation and infection control measure.

10. References

i) HAHO Operations Circular No. 13/2001

ii) Occupational Safety and Health Ordinance

iii) WHO Infection Control Guideline who/cds/tb/99.269

(Updated in Jan 2003)