

Minutes of the First meeting of the National Airborne Infection Control Committee

LRS Institute, New Delhi
18th-19th September, 2008

The first meeting of the National Airborne Infection Control Committee (NAICC) was held at LRS Institute, New Delhi on 18th-19th September, 2008 under the chairmanship of Prof S K Jindal. The list of members and other participants is given in Annex I.

Prof Jindal, the Chairman of the Committee, welcomed all the members and participants. He highlighted the importance of the airborne infection control measures in reducing the risk of transmission of Tuberculosis. He also commended the programme for taking this initiative. This was followed by discussion on the following agenda points.

- **Proposed terms of reference for NAICC:**

The members discussed the terms of reference for the Committee. It was informed that although the guidelines were being developed by RNTCP, these would be pertinent to other airborne diseases like SARS, Avian Influenza etc. besides tuberculosis. Keeping this in view, the programme had requested participation of NICD, NACO and NRHM in the present meeting which unfortunately did not happen.

Recommendations

- The committee agreed on revised TORs. The revised TORs are placed at Annex II.
 - The Committee recommended that coordination with other relevant organisations like NICD, NACO, NRHM etc. will be crucial for wider acceptance and adoption of the guidelines by the general health system. Hence all efforts should be made to ensure their participation in all future meetings. It was also decided that the Committee members would also facilitate the implementation of the guidelines which should be included in the TORs.
- This was followed by a presentation on **the “International guidelines for airborne infection control”** by Dr Puneet Dewan. The presentation gave an overview of the airborne infection control including:
 - Concepts of transmission and risk
 - Overview of international guidelines
 - Hierarchy of Infection Control including administrative measures, environmental measures and Personal protective measures.

The presentation detailed the importance, advantages and limitations of the following measures for infection control in health settings:

- a. Administrative measures to reduce risk of exposure, infection and disease, through policy and practice: These include:

- i. Screening patients for respiratory symptoms
 - ii. Fast-tracking of chest symptomatics
 - iii. Health Education on Cough Hygiene
 - iv. Well-ventilated waiting area for respiratory symptomatics
 - v. Safe collection of sputum
- b. Environmental Measures to reduce concentration of infectious bacilli in air in areas where contamination of air is likely. These include:
- i. Isolation / Spacing
 - ii. Ventilation - Natural and assisted/mechanical to ensure adequate air changes (ACH) of >6 times per hour in typical health care setting and >12 ACH in high risk settings. Effective ventilation includes control of flow of air so that clean air comes in and contaminated air goes outside away from the patient care areas.
 - iii. Ultraviolet Germicidal Irradiation (UVGI) / High efficiency particulate air (HEPA) filtration.
- c. Personal respiratory protection to protect personnel who must work in environments with contaminated air. This includes the use of respirators and masks.

Recommendations:

- National guidelines be organized according to the above principles, but should also include a generic airborne infection control plan with specific recommendations for different types of healthcare facilities, and settings within these facilities based on the level of risk.
- This was followed by presentation by Dr Chandrashekhar (Senior Architect, Dte. GHS) on the **“Architectural standards in India as related to airborne infection control: Current situation, opportunities for improvement, and possible mechanisms for implementation”**

Dr Chandrashekhar discussed in detail the environmental/engineering measures necessary for ensuring airborne infection control. These include:

- a. Optimal layout of the hospitals, wards, OPD areas and high risk settings to ensure adequate natural ventilation
- b. First-level environmental controls consist of augmenting natural ventilation by using mechanically-assisted intake or exhaust ventilation (e.g., exhaust fans or blowers) and diluting and removing contaminated air by using HVAC (Heating, Ventilation and Air Conditioning) systems.
- c. Second-level environmental controls consist of controlling the airflow to prevent contamination of air in areas adjacent to the source (as in airborne isolation rooms) and sterilizing air by properly planned, installed, and maintained UVGI. Another second-level option discussed was HEPA filtration,

though its use was generally discouraged due to maintenance challenges in view of the Indian conditions and recurring expenses.

Dr Chandrashekehar emphasized the importance of involving medical architects in the design of the healthcare facilities so that the infection control measures could be ensured. Some of the key findings from the presentation were:

- a. Even at the lowest of wind speeds, air-exchange from well-designed natural ventilation, such as rooms with large windows on both sides of the room to facilitate cross-ventilation, exceeded that usually provided by mechanical ventilation systems.
- b. Simple process of opening windows and doors provides maximum natural ventilation and this lowers the risk of airborne transmission.

The committee agreed on the critical need to involve architects and engineers in the development of national guidelines, to consider how implementation architectural and engineering standards can be enforced, and to include medical architects, public works departments, and engineers in capacity-building and sensitization plans and efforts.

- This was followed by a report on the field visits undertaken by Dr Paul Jensen (CDC) alongwith Dr Puneet Dewan (WHO) and CTD representatives. The field visits were undertaken in Delhi, Hyderabad and Kolkata for assessments of RNTCP DOTS-Plus sites wards (indoor facilities), NACP ART centres, Medical Colleges, IRLs and other health care facilities to evaluate the risk of transmission of airborne infections including TB and to provide recommendations to sites on ways to reduce the risks.

The key observations of the team were:

- DOTS Plus site inpatient wards: At two of the four DOTS-Plus sites there was effective use of natural cross-ventilation, with wide bed-spacing and patients being educated about cough hygiene. Minimal corrections were recommended. At a third site, natural ventilation was not adequate, UV lights were being incorrectly used, and exhaust fans were poorly planned, installed, and maintained. A fourth DOTS-plus site used mechanical ventilation, which was assessed as adequate, though minor optimizations were suggested, including the removal of unnecessary HEPA filtration of intake and exhaust air.
- Medical College registration and OPDs: In the Medical Colleges, it was observed that the registration and waiting areas were crowded with no administrative precautions, as a result there was a risk of on-going TB transmission in these areas, and missed opportunities to identify TB suspects early and reduce downstream transmission.
- Medical College inpatient wards: Cohorting of infectious patients away from susceptible patients was not seen. Infection control plans were infrequently found and were limited to safe injection practices and waste disposal. There was a tendency to install re-circulating air-conditioning systems leading to a

worsening of air exchange and safety in previously well-ventilated by natural ventilation.

- Medical College bronchoscopy rooms: Procedures were not in place to ensure that patients going for diagnostic bronchoscopy were AFB-negative. Bronchoscopy rooms were usually inadequately ventilated. Exhaust fans in some settings were pushing contaminated air into patient care areas. No appropriate personal respiratory protection was being used during bronchoscopy by the staff, and no particulate respirators were available. Fumigation, which is of doubtful efficacy for airborne pathogens, was being relied upon in some settings for infection control purpose.
- ART Centres: ART centres were observed to be invariably crowded. In most settings, screening for respiratory symptoms and TB diagnosis was being done only at the end of visit by the medical officers. No IEC material or activities on cough hygiene were seen. Indoor waiting areas were in some settings poorly ventilated. In some settings the use of recirculating air-conditioners was noted, to the great disadvantage of air exchange and patient safety.
- Laboratories: Biosafety cabinets uniformly failed rapid performance assessments at the Intermediate Reference Laboratories. Inadequate flows with non-containment of aerosols and particulate leaks around filters were frequently observed. Laboratory staff was inadequately trained in biosafety measures and self-assessment of equipment performance.
- Sputum collection: In most settings, sputum collection was conducted outdoors. Evaluation of specialized sputum collection rooms in one hospital found the use of UV lights sub-optimal and unnecessary, and the filtration of exhaust air unnecessary because of the given dilution.
- Smaller health care facilities: Most of the PHCs and CHCs visited were observed to have naturally ventilated waiting areas and OPDs. However administrative precautions were not being implemented. An important exception was noted in one district in WB, where district authorities had on their own initiative issued direct orders for laboratory technicians to pro-actively screen patients in the waiting room for TB symptoms, and evaluate them on priority.

Recommendations:

- a. National guidelines should provide clear guidance on UVGI, filters, and air cleaners, including the situations where they should be considered and minimum standards for maintenance.
- b. Natural ventilation should be relied upon as the primary environmental control, and the other environmental controls including augmented (fan-assisted) ventilation, UVGI, filtration, etc should be advised only as an adjunct to natural ventilation, in those situations where adequate natural ventilation was not possible.
- c. The use of climate control (air-conditioning, heating) should include measures to ensure adequate air-exchange as specified in national guidelines. This means some settings may have to compromise on climate control efficiency and

- effectiveness in order to achieve the minimum standard needed for patient safety.
- d. Regulation for enforcing airborne infection control measures in all health care settings is needed.
 - e. The Committee also felt that in order to assess the existing health care settings for the adequacy of airborne infection control, certain assessment equipments like anemometer, UV meter etc. were required. These should be available at the state level.
- This was followed by a presentation on the **“Evidence of TB transmission in health care facilities in India” by Dr A Aggarwal, PGIMER.**

The presentation reviewed the literature available on transmission of TB amongst healthcare workers. Studies show that there is an increased risk of transmission of TB in health care facilities, as measured by exceptionally high rates of TB disease and TB infection among healthcare workers. The following possible explanations were cited:

- a. Increased risk of exposure which happens as a result of large load of ‘open Pulmonary TB’ cases, delay in diagnosis and starting therapy and suboptimal treatment.
- b. Poor infection control measures as evidenced by poor patient education regarding cough etiquette, inadequate ventilation, overcrowded OPDs and wards, clustering together of infectious and susceptible patients, and lack of personal respiratory protection equipment.
- c. Gaps in knowledge and awareness reflected by belief that TB is an unavoidable occupational hazard, and lack of education on occupational safety and hygiene amongst healthcare workers.

The main conclusion from the presentation was that nosocomial transmission of tuberculosis is an important issue which needs to be addressed. There is a proven high risk and rate of transmission of tuberculosis to both healthcare workers and patients. The existing healthcare infrastructure and infection control measures are ill-equipped to deal with this large problem and urgent remedial measures necessary.

- This was followed by a presentation on the **“Proposed elements to be included in airborne infection control guidelines”** by Dr Fraser Wares.
- After discussion, the committee recommended that the following be included in the guidelines.
 - **Background**
This would include the importance of airborne infection control, overview of transmission and pathogenesis of TB
 - **Definitions**
 - **Scope of guidelines:** The guidelines will be useful for all kinds of health facilities including Sub-Centre, PHC, CHC, District Hospitals, Tertiary care

centres, Private facilities and high risk areas within the facilities. These high risk areas include TB/Chest OPD, MOPD, Wards, DOTS Plus sites, ART Centres, Bronchoscopy suites, Culture and DST Labs, ICU and OTs

- **Risk assessment check list:** The checklist will provide guidance on how to undertake a risk assessment in the different health facilities. It will also help in categorizing the health care facility and specific areas within the facility based on the level of the risk involved and the levels of measures which need to be implemented in the different risk areas.

- **Administrative Measures:**
 - **OPDs:**
 - Screening of patients for respiratory symptoms with details on appropriate mechanisms and levels of screening for different settings. The Committee recommended that the chest symptomatics should ideally be screened at the registration area. The screening could be done by Nurses/Paramedics or volunteers.
 - Adjunctive IEC on TB symptoms and cough hygiene. This could either be done on a one to one basis through counsellors or through educative material displayed in registration areas, OPDs etc.
 - Provision of a well ventilated waiting area for patients. Separate waiting area for chest symptomatics if possible.
 - Fast tracking of chest symptomatics: The members felt that fast tracking of patients would be difficult in view of the large number of chest symptomatics attending the OPDs. Some of the questions which remained unanswered were who would fast track the patients; whether the chest symptomatics would be fast tracked to the lab/x-ray or to the doctor. It was decided that fast tracking should be piloted in a few health care settings prior to its inclusion in the guidelines.
 - Decompression / patient flow control / reduction in waiting time

 - **Inpatient facilities:**
 - Stringent criteria for admission of patients
 - Prolonged/unnecessary stay of patients in the hospitals to be avoided
 - Cohorting/placement of patients, i.e. placing infectious TB patients – particularly those with known or suspected drug resistant TB – away from HIV-infected or immunocompromised patients.
 - Adequate spacing of beds in the wards
 - Restricted access to wards. Visits of attendants and visitors to the wards to be minimised, especially in high risk settings
 - Education on cough hygiene
 - Adequate sputum disposal

- Provision of surgical masks to smear-positive TB patients - to be worn preferably throughout the day, but mandatory when going out from the indoor facility e.g. to visit the Xray department, etc.
- **Environmental/Engineering Measures:** These would include the following:
 - Ventilation standards for different healthcare facilities and areas within the facilities. These include optimal air changes per hour (ACH) for different types of facilities.
 - ◆ Natural ventilation with simple guidance on ensuring unrestricted openings through creative use of vents and louvres etc, and guidance on the minimum amount of unrestricted openings on at least 2 sides needed to ensure adequate air-exchange.
 - ◆ Forced air natural ventilation with technical guidance on specifications of equipment and their adequate installation
 - ◆ Mechanical ventilation, with technical guidance for specifications
 - **UVGI:**
 - ◆ Criteria for use of UVGI - When to consider , e..g high risk areas and where natural ventilation is not possible.
 - ◆ Prequalification criteria - including maintenance, measurement etc.
 - ◆ Technical guidance on specifications and installation
 - **Filtration (HEPA Filters):**
 - ◆ Criteria for use of filtration
 - ◆ Warnings regarding impracticality in most situations
 - ◆ Situations where use might be considered - especially in Bronchoscopy suites, Laboratories, MDR Wards
 - ◆ Maintenance and replacement of filters
 - **Fumigation:** Fumigation as a method of infection control was discussed and it was concluded that although this method was being widely used, especially in laboratories, its role in reducing transmission of airborne pathogens is doubtful. Therefore it should be recommended only after further review of existing evidence.
 - **Airborne Isolation Rooms:** In some hospitals airborne, isolation rooms are available for admitting TB patients. Specifications for these rooms should be provided.
 - **Layout considerations for health care facilities:** These would include the design/layout of hospitals with a special focus on the following areas - Registration, Waiting areas, DOT centres, OPD, Wards, Labs, Bronchoscopy rooms.
 - **Cost consideration** for engineering controls including the initial and recurring expenditure towards maintenance to be included in the guidelines.

- **Enforcing the implementation of environmental/engineering standards and controls**
- **High risk settings:**
 - **DOTS Plus sites:** In view of the high risk of transmission the highest level interventions would be required which include:
 - A specified minimum air changes per hour that should be achieved at all times and during all seasons.
 - Control of airflow implemented and maintained.
 - Administrative restrictions for visitors, staff and attendants.
 - Adequate bed spacing based on minimum requirements for volume per patient or square foot area per patient
 - Ensuring cough etiquette through patient and family education
 - Ensuring proper sputum disposal
 - HIV infected staff should preferably not be posted in DOTS-Plus sites indoor facilities due to the potential risk of acquiring MDR-TB
 - Aerosol-inducing procedures (like sputum collection) should be conducted with care
 - **ART Centres:**
 - ART centres should not be adjacently located to DMC/DOT centres
 - Administrative measures, including early screening of clients for chest symptoms and early referral for diagnosis and initiation of treatment
 - Education of patients on cough hygiene, and provision of masks to symptomatic clients.
 - Fast tracking of chest symptomatics for HIV services
 - Minimum ventilation standards to ensure adequate air changes per hour
 - **Indoor/closed sputum collection area:**
 - Sputum collection preferable in open rather than closed areas
 - Specifications for closed areas to include:
 - ◆ Space requirements
 - ◆ Requisite air changes per hour
 - ◆ Considerations for additional measures like mechanical ventilation and application of HEPA and UVGI
 - **Bronchoscopy/procedure rooms**
 - Administrative measures
 - Adequate Ventilation
 - Air flow
 - Personal Protection Equipment (respirators)
 - **Labs**

- Administrative measures
 - Adequate Ventilation
 - Air flow
 - Personal Protection Equipment (respirators)
 - **Health Worker Capacity and Safety**
 - Capacity to be built through
 - Nomination of responsible persons for Infection control Committee of the health facility
 - Sensitization/Training by
 - ◆ Module/course/checklists
 - All staff to be trained – especially nurses and paramedical staff
 - ◆ Integrate core elements in RNTCP modules
 - ◆ Incorporate airborne infection control training into routine IC trainings , i.e. those for ‘universal precautions’, biomedical waste handling, and safe injection practices.
 - Safety of the health care worker to be given due importance
 - Basic implementation of AIC-best safety measure
 - Routine screening of healthcare workers for TB was not recommended. However surveillance for TB disease among health care workers could be considered and assessed on an operational research basis.
 - **Monitoring of Infection control activities:** It was recommended that process and outcome indicators may be developed by the infection control committee to monitor the infection control activities at the health facilities.
- Some of the other recommendations of the Committee were:
 - Efforts to be made to coordinate with other agencies like NICD, NACO and NRHM for inputs on other airborne diseases besides TB, which will be included in the guidelines
 - Airborne Infection Control should be an integral part of the general infection control trainings and RNTCP training modules
 - Assessment equipment like anemometer, UV meter etc. should be procured by Nagpur, Ahmedabad and Hyderabad out of RNTCP funds.
- The Committee constituted writing groups to prepare the draft text on each of the aforesaid topics of the guidelines. The writing groups will be as follows:
 - Background, Definitions, Scope and Risk Assessment check list and monitoring - **CTD**
 - Administrative measures and Bronchoscopy rooms - **PGI**
 - Inpatients and Indoor Sputum Collection areas - **LRS Institute**
 - Ventilation Standards, Layout and design – **DGHS & CTD**
 - UVGI, Filtration and Fumigation – **WHO & CTD**
 - DOTS Plus sites - **Dr Solanki**
 - ART Centres - **Dr Rajasekharan & NACO**

- Laboratories - **TRC**
- Healthcare worker capacity and safety - **NTI**

It was decided that these writing groups will submit their drafts to CTD within one month. The next meeting of the Committee will be held in November at which the draft guideline will be finalized, following which they will be pilot tested.

The chair concluded the session with a vote of thanks to all the participants.

Annex I

List of Participants:

1. Prof Dr S K Jindal, Head, Dept. of Pulmonary Medicine, PGIMER, Chandigarh – **Chairman**
2. Dr L S Chauhan , DDG(TB)
3. Dr D Behera, Director LRS Institute, New Delhi
4. Dr Ashutosh Agarwal, Dept. of Pulmonary Medicine, PGIMER, Chandigarh
5. Dr R Chandrashekharan, Sr Architect, CDB, CGHS
6. Prof. R K Solanki, Dept. of Pulmonary Medicine, BJMC, Ahmedabad
7. Dr Rajasekharan, Ex-Director, GHTM, Tambaram, Chennai
8. Dr Ranjini Ramachandran, Microbiologist, TRC, Chennai
9. Dr Anand, Microbiologist, NTI, Bangalore
10. Dr Rupak Singla, LRS Institute, New Delhi
11. Dr Puneet Dewan, MO-TB, WHO SEARO
12. Dr Fraser Wares, MO-TB, WHO India
13. Dr S Sahu, NPO, WHO India
14. Dr Devesh Gupta, CMO, CTD
15. Dr K S Sachdeva, CMO, CTD
16. Dr Rohit Sarin, LRS Institute, New Delhi
17. Dr Deepak Gupta, AIIMS, New Delhi
18. Dr Geetanjali Sharma, WHO Consultant, CTD
19. Dr Sarabjit Chadha, WHO Consultant, CTD

Annex II

Proposed TOR for NATIONAL AIRBORNE INFECTION CONTROL COMMITTEE

1. Review international guidelines and best practices for airborne infection control in health care facilities, and current infection control practices in health care facilities in India.
2. Develop technical and operational guidelines for airborne infection control.
3. Facilitate the implementation of the guidelines, and serve as resources for advocacy, capacity building, and evaluations.
4. Coordinate with other relevant agencies, patient safety initiatives, and seek the inclusion of airborne infection control measures in universal precautions.
5. Develop technical recommendations for engineering and architectural measures to reduce the risk of transmission of respiratory infections, and advocate for inclusion into Indian Public Health Standards and national and state regulations for health care facilities.
6. Develop and disseminate tools for health care facilities to assess risk, identify simple solutions, and monitor effectiveness of interventions to reduce risk of airborne disease transmission.
7. Revise and update guidance to account for the best available evidence and experiences.
8. Assist Dte. GHS and RNTCP in legal matters pertaining to infection control