SAARC

Regional Training Manual for Tuberculosis & HIV Infection Control at Health Facilities

SAARC tuberculosis and HIV/AIDS Centre
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S No	Details	Remarks
1	Registration	DAY-I
	Pretest	
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	Global Strategic Plan (2013-2015)	
	New Global Plan to Stop TB (2016 – 2020)	
2	Health in the millennium Development Goals for 2015 Goals, target and indicators for TB control Reducing transmission of TB in households, prioritizing measures and setting targets for TB infection control	
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3	Infection difference between infection and disease, importance of early diagnosis, tests etc. Increasing access to voluntary HIV/counseling and testing Community application of IC practice i) Occupational Exposures ii) Prevention of occupational infection Post Exposure and Treatment - HBV - HCV - HIV ❖ Blood borne infection ❖ Course summary Community Application of IC practices Exercise	DAY-III

Foreword

In spite of the remarkable global awareness on tuberculosis and HIV/AIDS, still there is lot to be done to stop the TB and HIV menace. There is urgent need for more action to move towards the WHO post-2015 strategy that aims to eliminate TB as a global epidemic by 2035.

The SAARC TB & HIV/AIDS Centre (STAC) has been coordinating the efforts of Member States in combating TB & HIV/AIDS epidemic. Along with the other regular activities, STAC conducts human resource development for health care provider to enhance and update the knowledge, to implement, sustain and scale up of various aspects of TB and HIV/AIDS Control activities in SAARC Member States.

This document is intended for conducting training thereby development of human resource in TB and HIV/AIDS control and prevention.

TB & HIV infection control are a combination of measures aimed at minimizing the risk of transmission within populations. Infection control requires and complements implementation of core activities in TB & HIV control and overall health-systems strengthening. It should be a major part of national infection prevention and control policies because it complements such policies – in particular, those that target including airborne infections.

We have made maximum efforts to incorporate all the detail information on this three days training manual

I sincerely hope the training provided with this manual will be fruitful for SAARC Member States in effective management of TB and HIV/AIDS

Lastly, I will be grateful for your valuable suggestions, feedback and comments that might be helpful to improve this present manual in future.

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Dr. Sharat Chandra Verma
Director
SAARC TB & HIV/AIDS Centre

Session: I

- **Goals, target and indicators for TB control**

- **Policy on TB infection in health care facilities.**

- **Reducing transmission of TB in households, prioritizing measures and setting targets for TB infection control**

Rational of the Training:

TB and HIV are leading public health problems in several countries. TB is a common cause of morbidity and death in HIV-infected persons. Persons with undiagnosed, untreated and potentially infectious TB are often seen in HIV care settings. Tuberculosis (TB) and HIV have been closely linked since the emergence of AIDS. Worldwide, TB is the most common opportunistic infection affecting HIV-sero-positive individuals, and it remains the most common cause of death in patients with AIDS. HIV infection has contributed to a significant increase in the worldwide incidence of TB. Considering the fact, the SAARC Member States have accorded high priority for TB and HIV/AIDS Control programmes.

Target audience:

This module has been developed for programme manager, health care provider/public health expert at health centres or district hospital outpatient clinics.

Training Objectives:

To provide evidence-based training on to TB/HIV infection control at health facilities.

This course can be provided in continuation to the TB, TB/HIV co-management training or as a stand-alone course.

Training duration: Three Days

Subjects covered:

- Global Strategic Plan
- New Global Plan to Stop TB (2015-2020)
- Health in the millennium Development Goals for 2015
- Policy on TB infection control in health care facilities
- HIV/AIDS Treatment target to end the AIDS epidemic by 2020
- Environmental Control
- Increasing Access to Voluntary HIV Counseling and Testing
- Community Application of IC practice
- When to start PE treatment
- HIV/AIDS Treatment target

Training methodology:

This course adopts a participatory and interactive approach. Participants will work through the sections with the aid of facilitators and learn through a combination of individual reading sessions, group discussions, facilitator-led drills, short answer exercises and case studies. The course is designed to maximize involvement of all participants.

Note:

. Case studies should be done individually (with feedback from the facilitator).
. Drills are to done as group sessions.

Role of STAC

One of the major functions of STAC is to develop human resource essential to implement, sustain and scale up of various aspects of TB and HIV/AIDS Control activities. Training is one of the fundamental components of National Tuberculosis and HIV/AIDS Control Programmes and becomes more important for effective implementation of new strategy in TB and HIV/AIDS Control Programmes. STAC has been organizing Trainings in various aspects of TB and HIV/AIDS since 1994 and trained ample number of professionals and health workers working for prevention and control of tuberculosis in the Member States.

Global Strategic Plan (2013-2015)

Overview

The Health Systems Global strategic plan is intended to identify priorities to guide decision-making, provide the basis for determining resource requirements and serve as the basis for planning specific activities to achieve strategic goals. The strategic plan is expected to guide Health Systems Global from mid-2013 through the end of 2015.

Strategic Objectives:

1. Build health systems research communities that encompass policy-makers, researchers, NGOs and funders.
   Rationale: The development of the field of health systems research has been undermined by fragmentation within the community, both among researchers who often come from different disciplinary perspectives, and between researchers and users of research. As a society that embraces all of these groups, Health Systems Global will seek to build stronger linkages across them.

2. Advance the field of health systems research through further development of health systems research methods, and of the skills and competencies of Health Systems Global members
   Rationale: Health systems research is a relatively young field and, drawing as it does upon multiple disciplines and methods, there is a need to develop the field through improved conceptual frameworks, taxonomies, methods, measures, and criteria for evaluating the strength of evidence. Health Systems Global will also help to build skills across those active in the field through a variety of strategies to support capacity development for individuals.

3. Mobilize and support relevant communities to engage in and advocate for health systems research

Rationale: The very nature of the issues that are the focus of health systems research demands broad participation in the inception, development and dissemination of research. Health Systems Global embraces the need for pluralistic, people-centred approaches to promoting the use of evidence in policies and programs. This engagement is critical not only in enhancing the use of evidence but also in increasing public recognition of the value of investing in health systems research.

4. Ensure that Health Systems Global is strong and sustainable
   Rationale: As a new society there is much that Health Systems Global needs to do to build its own organizational and governance structures and capacities so that it can continue its work in a sustainable fashion.

New Global Plan to Stop TB (2016 – 2020)

The World Health Organization has adopted a post-2015 strategy that aims to eliminate TB as a global epidemic by 2035. To achieve this ambitious goal, significant changes need to be made to the way most countries organize and run their TB interventions and programs, and we need to see significant acceleration in research and development of new drugs, diagnostic tools and a vaccine. The new Global Plan to Stop TB 2016 - 2020 will outline what it takes to set the world on the right track to reach the goals set in the post-2015 Global TB Strategy.

Goals, targets and indicators for TB control

The global targets and indicators for TB control were developed within the framework of the MDGs as well as by the Stop TB Partnership and the WHA. The impact targets are to halt and begin to reverse the incidence of TB by 2015 and to reduce by 50% prevalence and mortality rates by 2015 relative to 1990 levels. The outcome targets – to achieve a case detection rate of new smear-positive cases of at least 70% and to reach a treatment success rate of at least 85% for such cases – were first established by the WHA in 1991. Within the MDG framework, these indicators were defined as the proportion of cases detected and cured under DOTS. The ultimate goal of eliminating TB, defined as the occurrence of less than 1 case per million populations per year by 2050, was set by the Stop TB Partnership. The TB Control Programmes focuses on the five principal indicators that are used to measure the impact and outcomes of TB control: incidence, prevalence and deaths (impact indicators) and case detection and treatment success rates (outcome indicators).

HIV/AIDS treatment target to end the AIDS epidemic by 2020

Ending the AIDS epidemic is more than a historic obligation to the 39 million people who have died of the disease. It also represents a momentous opportunity to lay the foundation for a healthier, more just and equitable world for future generations. Ending the AIDS epidemic will inspire broader global health and development efforts, demonstrating what can be achieved through global solidarity, evidence-based action and multi-sectoral partnerships.

Although many strategies will be needed to close the book on the AIDS epidemic, one thing is certain. It will be impossible to end the epidemic without bringing HIV treatment to all who need it. As the world contemplates the way forward following the 2015 deadline for the targets and commitments in the 2011 Political Declaration on HIV and AIDS, a final target is needed to drive progress towards the concluding chapter of the AIDS epidemic, promote accountability and unite diverse stakeholders in a common effort. Whereas previous AIDS targets sought to achieve incremental progress in the response, the aim in the post-2015 era is nothing less than the end of the AIDS epidemic by 2030. In December 2013, the UNAIDS Programme Coordinating Board called on UNAIDS to support country- and region-led efforts to establish new targets for HIV treatment scale-up beyond 2015. In response, stakeholder consultations on new targets have been held in all regions of the world. At the global level, stakeholders assembled in a variety of thematic consultations focused on civil society, laboratory medicine, paediatric HIV treatment, adolescents and other key issues. Powerful momentum is now building towards a new narrative on HIV treatment and a new, final, ambitious, but achievable target:

- ✓ By 2020, 90% of all people living with HIV will know their HIV status.
- ✓ By 2020, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy.
- ✓ By 2020, 90% of all people receiving antiretroviral therapy will have viral suppression.

Preamble:

This document is an evidence-based policy for the implementation of sound tuberculosis (TB) and HIV infection control by all stake-holders. TB and HIV infection control is a combination of measures aimed at minimizing the risk of transmission within populations. The foundation of infection control is early and rapid diagnosis, and proper management of patients.

TB infection control requires and complements implementation of core activities in TB control, HIV control and health systems strengthening. It should be part of national

infection prevention and control policies because it complements such policies, in particular, those that target airborne infections.

The evidence base for the policy was established through a systematic literature review. The review highlighted some areas where evidence supports interventions that add value to TB infection control. A number of recommendations were developed, based on this evidence and on additional factors, such as feasibility, programmatic implementation and anticipated cost. TB infection control requires action at national and sub-national level to provide managerial direction, and at health facility level to implement TB infection control measures.

The national and sub-national managerial activities listed below provide the managerial framework for the implementation of TB infection control in health-care facilities, congregate settings and households.

1. Identify and strengthen a coordinating body for TB infection control, and develop a comprehensive budgeted plan that includes human resource requirements for implementation of TB infection control at all levels.

2. Ensure that health facility design, construction, renovation and use are appropriate.

3. Conduct surveillance of TB disease among health workers, and conduct assessment at all levels of the health system and in congregate settings.

4. Address TB infection control advocacy, communication and social mobilization (ACSM), including engagement of civil society.

5. Monitor and evaluate the set of TB infection control measures.

6. Enable and conduct operational research.

These activities should be integrated within existing national and sub-national management structures for general infection prevention and control, if such structures exist. The measures listed below are specific to health-care facilities.

Facility-level measures

Implement the set of facility-level managerial activities:

a) Identify and strengthen local coordinating bodies for TB infection control, and

develop a facility plan (including human resources, and policies and procedures to ensure proper implementation of the controls) for implementation.

b) Rethink the use of available spaces and consider renovation of existing facilities or construction of new ones to optimize implementation of controls.
c) Conduct on-site surveillance of TB disease among health workers and assess the facility.

d) Address advocacy, communication and social mobilization (ACSM) for health workers, patients and visitors.
e) Monitor and evaluate the set of TB infection control measures.
f) Participate in research efforts.

Administrative controls:

Promptly identify people with TB symptoms (triage), separate infectious patients, control the spread of pathogens (cough etiquette and respiratory hygiene) and minimize time spent in health-care facilities.

Provide a package of prevention and care interventions for health workers, including HIV prevention, antiretroviral therapy and isoniazid preventive therapy (IPT) for HIV-positive health workers.

Environmental controls

Use ventilation systems.

Use ultraviolet germicidal irradiation (UVGI) fixtures, at least when adequate ventilation cannot be achieved.

Personal protective equipment: Use particulate respirators.

The administrative controls include (in addition to the items listed above) reduction of diagnostic delays, use of rapid diagnostic tests, reduction of turnaround time for sputum testing and culture, and prompt initiation of treatment.

The recommended set of measures are needed because TB infection control is at an early stage of development in most countries, based on reports to WHO from Member States in 2008. No country provided information or data on implementation of measures, although 66% (131/199) of countries stated that they had a policy on TB infection control.

All healthcare facilities, public and private, caring for TB patients or persons suspected of having TB should implement the measures described in this policy. The measures selected will depend on the infection control assessment, which is based on the local epidemiological, climatic and socioeconomic conditions, as well as the burden of TB, HIV, MDR-TB and XDR-TB.

Health-care facilities

The literature review suggests that implementation of controls as a combination of measures reduces transmission of TB in healthcare facilities. However, administrative controls should be implemented as the first priority because they have been shown to reduce transmission of TB in healthcare facilities. Administrative controls are needed to ensure that people with TB symptoms can be rapidly identified and, if infectious, can be separated into an appropriate environment and treated promptly.

Potential exposure to people who are infectious can be minimized by reducing or avoiding hospitalization where possible, reducing the number of outpatient visits, avoiding overcrowding in wards and waiting areas, and prioritizing community care approaches for TB management.

The administrative controls should be complemented by the environmental controls and personal protective equipment, because evidence shows that these measures also contribute to a further reduction of transmission of TB.

The environmental controls implemented will depend on building design, construction, renovation and use, which in turn must be tailored to local climatic and socioeconomic conditions. However, installation of ventilation systems should be a priority, because ventilation reduces the number of infectious particles in the air. Natural ventilation, mixed mode and mechanical ventilation systems can be used, supplemented with ultraviolet germicidal irradiation (UVGI) in areas where adequate ventilation is difficult to achieve.

Personal protective equipment (particulate respirators) should be used with administrative and environmental controls in situations where there is an increased risk of transmission.

Congregate settings

Congregate settings range from correctional facilities and military barracks, to homeless shelters, refugee camps, dormitories and nursing homes. In such settings, there is a need for coordination with policy makers responsible for such settings beyond the purview of ministries of health. Reduction of overcrowding in any congregate setting, and in particular in correctional services, is one of the most important measures to decrease TB transmission in such settings.

Households

To reduce the transmission of TB in households, any information, education and communication activity for prevention and management of TB should include behaviour and social change campaigns. Such campaigns should focus on how communities and, in particular, family members of smear-positive TB patients and health service providers can

minimize the exposure of non-infected individuals to those who are infectious. This will ultimately translate into healthier behaviour of the entire community in relation to prevention and management of TB.

In addition to recommendations for national managerial activities and a focus on healthcare facilities and congregate settings, as well as households, this policy differs from previous guidelines on TB infection control in having a greater focus on:

- design of buildings and use of space
- the role of communities, which have a right to be able to attend a clinic or hospital without fear of contracting TB, and for health workers to work in safer environments (this policy includes provision of a package of HIV prevention, treatment and care measures for health workers)
- the need for health workers to undergo TB diagnostic investigation if they have symptoms or signs suggestive of TB, and to be given appropriate information and encouraged to undergo HIV testing and counseling
- the need for health workers found to be HIV-positive to be given support, and for measures to be implemented to reduce their exposure to TB (particularly MDR-TB and XDR-TB)
- awareness raising activities in the community to garner social support for decreasing TB transmission in the community, to contribute to sustainable change toward healthy behaviour, and to minimize the associated stigma through community education
- the role of advocacy for improved TB infection control, through the removal of obstacles that impede wide implementation of TB infection control activities
- minimizing time spent in health facilities, including clinics, and prioritizing models of community based approaches in a context of proper case management and a patient centered approach.

The literature review undertaken for this document:

- identified major knowledge gaps in terms of the efficacy and effectiveness of infection control measures
- showed the need for TB infection control research to be scaled up and to be considered a crucial component of TB, HIV and general infection control research efforts.

The success of this policy depends on its rapid implementation. For this to happen, costs for the implementation of all the elements of the policy will need to be defined and adequate resources will need to be identified. In addition, scale-up of TB infection control will require simple indicators to monitor success in working towards safer health services for all.

Policy on TB Infection control in Health Care facilities

This document is an evidence-based policy for the implementation of tuberculosis (TB) infection control by all stake- holders. TB infection control is a combination of measures aimed at minimizing the risk of TB transmission within populations. The basis of such infection control is early and rapid diagnosis, accompanied by proper management of TB patients.

TB infection control is a subcomponent of the WHO's updated Stop TB strategy, contributing to strengthening of health systems and is also one of the elements of the collaborative activities for control of TB and HIV as recommended by the WHO. It is one of the "I"s in the WHO's "Three I's for HIV/TB" (the other two being isoniazid preventive therapy [IPT] and intensified case finding). It is an essential part of sound HIV control programmes in countries with high HIV prevalence.

TB infection control requires and complements the implementation of core interventions in TB control, HIV control and strengthening of health systems. In addition, countries should include TB infection control in their national infection prevention and control policies, and should maximize synergies between programmes that deal with infection prevention and control, and those focusing on TB and HIV control.

TB infection control cuts across disciplines. The measures taken to control infection, even those that are TB specific, strengthen health services as they draw from different areas of expertise in their design and implementation and thus improve collaboration between disciplines. Once established, a sound infection control framework provides the basis from which other health programmes can benefit.

Successful implementation of TB infection control requires:

- sound technical guidance;
- coordinated efforts from the ministries of health, finance, justice, labour, public works and environment;
- co-ordination between different national specific disease control programmes;
- co-ordination between health authorities at the national and sub-national level;
- contributions from technical partners and civil society;
- major advocacy mobilization to remove obstacles that impede widespread implementation of activities; and adequate funding at all levels.

Rationale

TB infection control is finding increased importance due to the association of TB with HIV; the emergence of multidrug-resistant TB (MDR-TB) and extensively drug-resistant TB (XDR-TB).

This document has been developed as a response to the demand from countries for

guidance on how to prioritize TB infection control measures at the national level. TB infection control is at an early stage of development in most countries. No country has sufficient information or data on implementation of measures, although 66% (131/199) of those reporting stated that they had a policy on TB infection control.

This document focuses on providing guidance on TB infection control in health-care facilities, since people working in such settings have a higher incidence of TB than the general population. Incidence of TB among people living or working in congregate settings (e.g. correctional facilities or nursing homes) and among household contacts of TB patients also exceeds the incidence found in the general population.

Objective

The aim of the policy is to provide Member States with guidance on methods to reduce the risk of TB transmission in health- care facilities, congregate settings and households, and prioritization of TB infection control measures.

3. Target audiences

The document is aimed at national and sub-national policy makers, including the health system managers of programmes covering TB, HIV/AIDS, infection control, hospital services, quality assurance programmes and occupational health.

3. Scope

The policy describes a set of elements that will help to break the chain of transmission of TB in health-care facilities, congregate settings and in households. In contrast to previous guidelines, which focused on facilities this WHO-recommended policy on TB infection control provides guidance to WHO Member States on what to do and how to prioritize TB infection control measures at national level, and includes recommendations for national managerial activities. Previous guidelines from the WHO and the Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, United States of America (USA) provide the framework for managerial activities at facility level, and can be used as a reference guide for implementing TB infection control at this level . The current document updates specific control measures described in previous WHO guidelines.

In contrast to previous guidelines, managerial activities at facility level are considered here as a separate element, rather than being included in administrative control. Managerial activities at facility level need to be in line with and complement national managerial activities.

This document also places increased emphasis on the particular administrative and

environmental controls that need to be implemented, and on personal protective equipment. Although the main focus is on health-care facilities, guidance is also provided on TB infection control in households and congregate settings.

Other new areas in this policy include:

• A special focus on design of buildings and use of space

• Increased emphasis on particular activities such as: integration with other health-system efforts; greater involvement of civil society in the design, development, implementation, and monitoring and evaluation of TB infection control; greater emphasis on selective administrative controls (e.g. reduction of time spent in health-care facilities); and provision of a package for HIV prevention, treatment and care measures for health workers.

This policy complements the following:

General infection control efforts

These include the universal precautions such as:

- ✓ hand hygiene
- ✓ cough etiquette
- ✓ respiratory hygiene
- ✓ personal protective equipment and apply to all healthcare facilities, as well as core interventions in TB, HIV and other health systems.

Airborne infection control efforts

These include precautions such as:

- ✓ patient placement
- ✓ use of adequately ventilated areas
- ✓ use of particulate respirators that are applicable to all health-care facilities caring for patients with, or suspected of having, airborne infections. Such precautions are important because Mycobacterium tuberculosis – the causative agent of Tuberculosis – is spread almost exclusively through droplet nuclei via air. Hand hygiene does not directly decrease TB transmission, is an essential aspect of good infection control practices.

Studies show that implementation of the administrative and environmental controls and personal protective equipment reduce transmission of TB in health-care facilities. Thus, for all facilities – public and private – caring for TB patients or persons suspected of having TB implementation of these measures is imperative. The combination of measures selected for implementation would be based on the infection control assessment and confirm to local programmatic, climatic and socioeconomic conditions.

This policy also describes how to prioritize TB infection control measures, depending on the burden of TB, HIV and MDR- TB. It however, does not cover recommendations for laboratory bio-safety, since these are addressed elsewhere. The TB infection control measures recommended in this policy is intended to minimize the risk of TB transmission in health- care facilities and congregate settings.

The community has a right to safe health care and to be able to attend a clinic or hospital without fear of contracting TB; also, health workers have a right to a safe working environment. The measure would be delivered as part of a patient centered approach.

Awareness-raising activities in the community garner social support for decreasing TB transmission in the community. Such activities also help to increase sustainable behaviour and social change. It also minimizes the stigma inherently associated with identifying potentially infectious individuals and placing them in safe, separate environments. Communities play an important role and have a great responsibility in preventing TB transmission in congregate settings and households.

All these measures create a supportive environment for detection of new cases and provision of care. This policy makes clear that sustained political, institutional and financial commitment are needed, along with the involvement of all disciplines that can promote implementation of adequate TB infection control measures in the context of general infection, prevention and control programmes.

Policy formulation process

This policy was drafted in September 2008; in collaboration with various departments of WHO viz. the Department for Epidemic and Pandemic Alert and Response, the HIV/AIDS Department and the Patient Safety Programme. The draft was circulated to the members of the systematic review and policy panel, WHO regional offices (including TB, HIV/AIDS and infection control focal points), members of the core team of the TB infection control subgroup of the TB/HIV working group, chairs of the implementation working groups of the Stop TB partnership, partner organizations and additional reviewers. Geographical, technical, end-user and gender representation were reflected in the constituency of the panels.

Evidence levels

Coordinated action is not possible without a managerial framework that facilitates implementation of TB infection control measures. To date, there has been no comparison between different managerial structures. Thus, evidence for managerial activities is not readily available, and no level of evidence is given for these activities. However, those implementing this policy should evaluate such activities to be better informed regarding

their role in the implementation of TB infection control measures.

For the recommended administrative controls, environmental controls and personal protective equipment, this policy provides a level of evidence that is proportionate to the strength of the public health recommendations. No literature review has been done for selected administrative controls aimed at minimizing diagnostic delays, such as early diagnosis, use of rapid diagnostic tests, reducing sputum and culture turnaround time, and prompt initiation of treatment. This is because these measures are also the basis of sound TB control, and justification for their implementation is addressed elsewhere. Nevertheless, these measures are still listed here as essential administrative controls to be implemented.

For provision of isoniazid preventive therapy (IPT), systematic reviews were available that helped determine the efficacy of this measure in preventing TB. The impact of antiretroviral therapy on reduction of TB incidence in HIV- positive patients has also been documented. Its provision would be considered as part of a package of prevention of infection and care for health workers, in the context of universal access to services for HIV prevention, treatment and care.

This policy does not cover recommendations on high-efficiency particulate air (HEPA) filters, but acknowledges their use for selected situations and is also recommended by expert opinion, and based on climatic, cultural, cost and programmatic factors. Recommendations are either 'strong' (i.e. the desirable effects outweigh the undesirable effects) or 'conditional' (i.e. the desirable effects probably outweigh those that are undesirable).

Set of control activities – national and sub-national

At this level all managerial activities provide policy makers at national and sub-national level with a comprehensive frame-work that can support and facilitate the implementation, operation and maintenance of TB infection control in health-care facilities, congregate settings and households. This should be based within existing national or sub-national infection control management structures, where such structures exist.

Infection control for congregate settings

The recommendations for congregate settings are less specific than those for health-care facilities, since congregate settings are so diverse. They include a mix of settings that range from correctional facilities and military barracks, to homeless shelters, refugee camps, dormitories and nursing homes. Each facility differs in the type of population it contains and the duration of stay of dwellers; which in turn, affects the dynamics of TB transmission. For the purpose of this policy, congregate settings are divided into two categories – long term (e.g. prisons) and short term (e.g. jails and homeless shelters) – to reflect the different durations of stay of the inhabitants.

It focuses particularly on prisons as evidence from such settings is readily available; however, the recommendations apply to other congregate settings too. As more evidence becomes available, the guidance would be updated to better reflect the specific needs of particular settings. Any health-care facility (e.g. medical or infirmary) within a congregate setting should be considered for implementing the set of TB infection control measures, as in any health-care facility within the same geographical area or having the same epidemiological characteristics.

The incidence of TB infection and disease among individuals in congregate settings exceeds the incidence in the general population; particularly among prison inmates in high-income countries. The association of HIV and the emergence of MDR-TB and XDR-TB increase the need to give urgent and appropriate attention to implementation of TB infection control in congregate settings, and to prioritize some elements, as discussed in this chapter.

Managerial activities in congregate settings

The full set of national and sub-national managerial activities should also apply to congregate settings. As a first step, policy makers responsible for congregate settings should be made part of the coordinating system for planning and implementing interventions to control TB infection. In particular, the medical services of the ministry of justice and correctional facilities should be fully engaged and encouraged to implement TB infection control. In any congregate settings, overcrowding should be avoided as it can lead to non-infected individuals being exposed to TB.

Congregate settings should be part of the country's surveillance activities, and should be included in facility assessment for TB infection control. Such assessment will be useful in determining the level of risk of the facility or building. Any advocacy and information, education and communication material should include a specific focus on congregate settings, as should monitoring and evaluation of TB infection control measures.

Facility-level managerial activities should also apply with some adaptation to congregate settings. This would facilitate the implementation of different types of controls as described below:

Administrative controls in congregate settings

To decrease TB transmission in congregate settings, cough etiquette and respiratory hygiene, and early identification, followed by separation and proper treatment of infectious cases should be implemented. In particular, all inmates of long-term stay facilities and inhabitants of other congregate settings should be screened for TB before entry into the facility. All staff should be given appropriate information and encouraged to undergo TB

diagnostic investigation if they have signs and symptoms suggestive of TB. People suspected of having TB and infectious patients should always be separated and, if possible, isolated.

Facility-level managerial activities will require adaptation because they were originally developed only for health-care facilities. Directly observed therapy (DOT) until sputum smear conversion and provision of an adequately ventilated area, while a patient is on treatment is also recommended.

In short-term stay congregate settings, such as jails and shelters, a referral system for proper management of cases should be established. In congregate settings with a high prevalence of HIV, particularly in correctional services, patients living with HIV and other forms of immunosuppression should be separated from those with suspected or confirmed infectious TB. All staff and persons residing in the setting should be given information and encouraged to undergo HIV testing and counseling. If diagnosed with HIV, they should be offered a package of prevention and care that includes regular screening for active TB.

Additional measures for groups at high risk – such as injecting and other drug users – should be ensured. In congregate settings with patients having, or suspected of having, drug-resistant TB, they should be separated from other patients (including other TB patients), and referral for proper treatment should be established.

Environmental controls in congregate settings

Buildings in congregate settings should comply with national norms and regulations for ventilation in public buildings, and specific norms and regulations for prisons, where these exist. Where ever there is a high risk of TB transmission and where adequate ventilation cannot be achieved – for example because of design constraints (e.g. in correctional facilities) – use of UVGI could be considered. If UVGI is used, fixtures should be designed to prevent injury from improper use or tampering with the device.

Personal protective equipment in congregate settings

When a person residing in a long-term stay congregate setting is suspected or diagnosed as having TB and is physically separated, the same recommendations on infection control apply as for health-care facilities. In short-term stay congregate settings, appropriate referral should be organized. The requirements for ventilation in public buildings are for the comfort of the user rather than for minimizing the risk of TB transmission.

Reducing transmission of TB in households

This chapter discusses the various actions needed to reduce transmission of TB in households. These are necessary since household members of persons with infectious TB are at a high risk of becoming infected and consequently developing the disease.
Pivotal studies from India during the 1950s evidenced that the major risks for infection are through close contact (exposure) to the infectious case before diagnosis. Whether the patient subsequently remains at home or moves to a sanatorium appears to have little impact on household transmission, provided the patient is treated effectively.

Early case detection remains one of the most important interventions for reducing the risk of TB transmission in the house-hold. TB contact investigation should be undertaken in line with the standards defined in the national TB control policies.

In addition, basic infection control, behavior -change campaigns, etc., should be part of any community information, education and communication messages. The infection control messages should promote the importance of early case identification, adherence to treatment and implementation of proper TB infection control measures (e.g. cough etiquette and respiratory hygiene) in the household before and after diagnosis of TB.

Behaviour-change campaigns for family members of smear-positive TB patients and health service providers should aim to minimize stigma and the exposure of non-infected patients to those who are infected.

To reduce exposure in households,

- houses should be adequately ventilated, particularly rooms where people with infectious TB spend considerable time (natural ventilation may be sufficient to provide adequate ventilation);

- inhabitants of the household should be educated on cough etiquette and respiratory hygiene, and should follow such practices at all times;

- while smear positive, TB patients should spend as much time as possible outdoors, they should sleep alone in a separate, adequately ventilated room and if possible avoid congregate settings and public transports.

It is not yet fully known how different drug-susceptibility patterns and HIV status affect the risk of TB transmission. Patients with MDR-TB usually undergo sputum conversion later than those with drug-susceptible TB, which could be probably due to the limited efficacy of the second line drug armamentarium. Hence, patients with drug-resistant TB remain infectious for much longer, even if treatment is initiated. This could prolong the risk of

transmission in the household. MDR-TB increases the risk of morbidity and mortality, particularly in people living with HIV additional infection control measures should therefore be implemented for the management of MDR-TB patients at home.

Awareness of infection control in the community should be promoted, irrespective of the drug susceptibility profile of the patient, as most MDR-TB cases remain undiagnosed but are nevertheless transmitted in the community.
Early in the history of treatment of drug-resistant TB, strict hospitalization of patients was considered necessary. However today, community-based approaches for management of patients with MDR-TB provided by trained lay and community health workers can achieve comparable results and, in theory, may decrease nosocomial transmission of TB.

Particular attention should be given to the quality of information, education and communication messages, to avoid any unintended stigma. In general, awareness of infection control in the community – even if well conducted – does not eliminate stigma attached to having TB. Therefore, such awareness needs to be balanced with the benefits that community education can bring, in terms of garnering social support for decreasing TB transmission in the community and helping to contribute to sustainable change toward healthy behaviour.

While culture positive, MDR-TB patients who cough should always practice cough etiquette (including use of masks) and respiratory hygiene when in contact with other people; health service providers ideally, should also wear particulate respirators (N-95) when attending to patients in enclosed spaces.
Family members of people living with HIV, or family members with strong clinical evidence of HIV infection, should not provide care for patients with culture-positive MDR-TB. If there is no alternative, HIV-positive family members should wear respirators, if available. Children below five years of age should spend as little time as possible in the same living spaces as culture-positive MDR-TB patients. Such children should be followed up regularly with TB screening and, if positive, drug-susceptibility testing and treatment.

Culture positive, XDR-TB patients should be isolated at all times, and any person in contact with such patients should wear a particulate respirator (N-95).If at all possible, HIV-positive family members, or family members with a strong clinical evidence of HIV infection, should not share a household with culture positive XDR-TB patients. For this purpose, if possible, potential renovation of the patient's home should be considered, to improve ventilation (e.g. building of a separate bedroom, or installation of a window or wind catcher, or both).

Prioritizing measures and setting targets for TB infection control

The association of HIV with TB, and the emergence of MDR-TB and XDR-TB, increases the urgency of the need to implement TB infection control and prioritize some elements in all settings.

Prioritization of TB infection control measures

For TB infection control, the first priority for all health-care facilities caring for TB patients or people with TB symptoms is to implement the set of TB infection control measures described. TB infection control builds on the implementation of general infection control efforts and those aimed at controlling airborne infection. This may also help to de-stigmatize TB infection, because the focus of the public health interventions is on providing universal access for patients with symptoms of communicable diseases (in particular, respiratory infections, rather than TB only).

The assessment will provide the basis for the selection of the best combination of administrative controls, environmental controls and personal protective equipment. The selection will also be informed by local epidemiological, climatic and socioeconomic conditions. To avoid nosocomial transmission of TB, time spent in health-care facilities (including clinics) should be minimized, and community-based approaches to the management of TB patients should be prioritized.

In HIV-prevalent settings, the focus in health-care facilities should be on:

- ✓ separating patients living with HIV and other forms of immunosuppression from those with suspected or confirmed infectious TB;
- ✓ the provision of a package of prevention and care for HIV-positive health workers;
- ✓ possible job re-allocation to lower risk areas in the case of HIV-positive health workers.

This focus by health-care facilities in HIV-prevalent settings should be in the context of implementing the set of TB infection control measures. In any country, all health-care facilities caring for MDR-TB should introduce the set of TB infection controls described. In particular, in the MDR-TB priority countries, it is important to focus on separating culture-positive drug-resistant TB patients or people suspected of having drug-resistant TB from other patients, including other TB patients. Another important aspect is ensuring a safe working environment for health workers caring for patients with, or suspected of having, MDR-TB and/or XDR-TB.

Within-country variation of the burden of TB (including MDR-TB and XDR-TB) and HIV should also be considered when deciding how to prioritize the different elements of TB infection control in health facilities within the country. The MDR-TB priority countries are

those where the estimated MDR-TB burden is more than 10% of the total number of TB cases, or countries with more than 4000 estimated MDR-TB cases emerging every year. Such countries account for 86% of the total estimated number of new MDR-TB cases worldwide

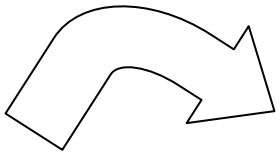
Targets for TB infection control

Literature review indicates:

- ✓ a lack of TB infection control measures in health-care facilities contributing to TB transmission
- ✓ Implementation of the TB infection control measures reduces transmission. However, it is not clear to what extent implementing TB infection control measures will contribute to reaching the internationally recommended targets for TB and HIV.

Research and further implementation of TB infection control

Research improves understanding of the contribution of TB infection control in meeting international targets. However, there is also a need for global and country targets to accelerate country-level implementation of TB infection control. Therefore, the targets are suggested for global-level implementation of the set of TB infection control measures. Countries are encouraged to develop their own targets in line with the global ones.



Session: II

- Infection difference between infection and disease, importance of early diagnosis, tests etc.
- Increasing access to voluntary HIV/counseling and testing
- Community application of IC practice

  iii) Occupational Exposures

  iv) Prevention of occupational infection
- Post Exposure and Treatment
  - HBV
  - HCV
  - HIV
- Blood bore infection
- Course summary

Session II:

Infection is the invasion of a host organism's body tissues by disease-causing agents, their multiplication, and the reaction of host tissues to these organisms and the toxins they produce.

Infectious diseases, also known as **transmissible diseases** or **communicable diseases**, comprise clinically evident illness (i.e., characteristic medical signs and/or symptoms of disease) resulting from the **infection**, presence and growth of pathogenic biological agents in an individual host organism .e.g., viruses, viroids, prisons, microorganisms such as bacteria, fungi such as ringworm, and other macro parasites such as tapeworms. Hosts can fight infections using their immune system. Mammalian hosts react to infections with an innate response, often involving inflammation, followed by an adaptive response. Physicians and veterinarians may use specific pharmaceutical drugs to treat infections.

Infection and Disease are two words that are often confused as one and the same. Infection is to be understood as lodgments and multiplication of the infectious agent in host tissue. Whereas, disease is the end result of an infection. On the other hand infection can also be caused by disease as in TB. A patient affected by TB infects people around him by airborne transmission via air exhaled by him or by cough.

This is one of the primary reasons why doctors ask patients affected by infectious diseases to be away from other people in the household. This is done to protect the people in the household from catching the infection produced by the disease. Infections can only be prevented but cannot be cured. Preventive measures alone are suggested to keep infections at bay.

TB disease occurs when the causative organism, Mycobacterium tuberculosis is active in a person's body in large numbers. People with TB disease usually have one or more symptoms of the disease. They may be infectious, which means they can pass the TB bacteria on to others. If it's not treated, TB disease can cause serious disability and even death.

People with TB infection do not exhibit symptoms because they have fewer of the organisms in their body, and they are latent. They can eventually develop the disease, especially if they are in one of the high-risk groups.

The successful arrest or cure of pulmonary, as well as laryngeal, tuberculosis depends largely on an early diagnosis and proper treatment. Almost every advanced, or moderately advanced, case of tuberculosis has passed through a curable stage. If the diagnosis can be made during this early, curable stage and proper treatment started, the patient has from 70-80% chances of a permanent cure or, at least, of an arrest of the disease. Many patients

suffer from failing health caused by pulmonary tuberculosis for from one to four years before the proper diagnosis is made.
There are several tests available to diagnose TB, and there are also tests to find out whether someone has TB bacteria that are susceptible to anti-TB drug treatment or are drug resistant. TB tests performed to find out if someone has drug resistant TB are known as drug susceptibility tests.

TB treatment, the aims:

- To cure the patient and restore quality of life and productivity;
- to prevent relapse of TB;
- to reduce the transmission of TB to others; and/
- to prevent the development and transmission of drug resistant TB.

TB treatment can cure most people who have TB, using a combination of the different drugs available for TB treatment. Surgery is also occasionally used in the treatment of TB. Patients started on anti-TB treatment regimens become non-infective by two months (end of intensive phase), proven by a negative culture report.

Infection Control:

Infection control is the discipline concerned with preventing nosocomial or healthcare-associated infection, a practical (rather than academic) sub-discipline of epidemiology. It is an essential, though often under recognized and under supported, part of the infrastructure of health care.

Infection prevention and control measures aim to ensure the protection of those who might be vulnerable to acquiring an infection both in the general community and while receiving care due to health problems, in a range of settings. The basic principle of infection prevention and control is hygiene.

Strategies for TB prevention

TB prevention consists of two main parts. The first part of TB prevention is to stop the transmission of TB from one adult to another. This is done through firstly, identifying people with active TB, and then curing them through the provision of drug treatment. With proper TB treatment someone with active TB disease will very quickly be non-infectious and so can no longer spread the disease to others. The second main part of TB prevention is to prevent people with latent TB from developing active, and infectious, TB disease.

Anything which increases the number of infectious people, such as the presence of TB

and HIV infection together, or which increases the number of people infected by each infectious person, such as ineffective treatment, etc., reduces the overall effect of the main TB prevention efforts. As a result it is then more likely that the number of people globally developing active TB will increase rather than decrease. There is a vaccine for TB, but it makes only a small contribution to TB prevention, as it does little to interrupt the transmission of TB among adults.

TB Treatment as TB prevention

TB drug treatment for the prevention of TB, also known as chemoprophylaxis, can reduce the risk of a first episode of active TB occurring in people either exposed to infection, or with latent TB. It can also reduce the risk of a recurrent TB episode.

For TB prevention the World Health Organization (WHO) recommends the drug isoniazid should be taken daily for at least six months and preferably nine months. The main "target" groups for TB prevention are those most at risk of progressing from latent to active TB. These include:

- Infants and children aged less than 4 years old;
- People infected within the previous two years;
- People infected with both TB and HIV;
- People who have certain clinical conditions or conditions which compromise their immune system, such as people with diabetes, and people with chronic renal failure.

Preventing TB transmission in households

In order to reduce exposure in households where someone has infectious TB, the following actions should be taken whenever possible:

- Houses should be adequately ventilated; and
- Anyone who coughs should be educated on cough etiquette and respiratory hygiene, and should

Follow such practice at all times;

While smear positive, TB patients should:

- Spend as much time as possible outdoors;
- If possible, sleep alone in a separate, adequately ventilated room;
- Spend as little time as possible on public transport; and
- Spend as little time as possible in places where large numbers of people gather together.

Cough etiquette and respiratory hygiene means covering your nose and mouth when coughing or sneezing. This can be done with a tissue, or if the person doesn't have a tissue

they can cough or sneeze into their upper sleeve or elbow, but they should not cough or sneeze into their hands. The tissue should then be safely disposed of.

Households where someone has culture positive MDR TB

It is not fully known how differences between drug susceptible, and drug resistant TB, as well as HIV status, affect the risk of TB transmission. However it is thought that people with drug resistant TB remain infectious for much longer, even if treatment has been started, and this may prolong the risk of transmission in the household.

In households with culture positive MDR TB patients, the following guidance should therefore be observed in addition to the measures given above:

- Culture positive MDR TB patients who cough should always practice cough etiquette (including use of nylon masks) and respiratory hygiene when in contact with people. Ideally health service providers should wear respirators (N-95 masks) when attending patients with infectious MDR TB in enclosed spaces;
- Ideally, family members living with HIV, or family members with strong clinical evidence of HIV infection, should not provide care for patients with culture positive MDR TB; and
- Children below five years of age should spend as little time as possible in the same living spaces as culture positive MDR TB patients.

Face masks are different from respirators and can be made from either cloth or paper. A face mask worn by someone with infectious TB can help to prevent the spread of M. tuberculosis from the patient to other people. The face mask can capture large wet particles near the mouth and nose of the patient, preventing the bacteria from being released into the environment. Cloth masks can be sterilized and reused.

Respirators can protect health care workers from inhaling M. tuberculosis in certain circumstances, but they are expensive to purchase and they require specialized equipment to ensure that they fit properly. The use of a face mask does not protect health care workers against TB, hence they should not wear a face mask in a household (or indeed in a health care) setting but instead wear the N-95 particulate respirator.

Households where someone has XDR TB

If some has culture positive XDR TB, then they should be isolated at all times, and any person in contact with a culture positive XDR TB patient should wear a particulate respirator. If at all possible, HIV positive family members, or family members with strong clinical evidence of HIV infection, should not share a household with a culture positive XDR TB patient.

Physical measures for TB prevention:

Before drug treatment for TB became available, removing TB patients from their homes and putting them in isolation in sanatoria, was the main way of reducing the transmission of TB.

However this policy changed in the vast majority of countries, after studies showed that if patients stayed at home and were treated on an "outpatient" basis, it did not increase the risk of TB amongst their household contacts. This is because drug treatment quickly makes a TB patient non-infectious, and most household contacts, would have already become infected before the diagnosis of TB has been made.

The only exception to this is, as described above, when someone has XDR TB, and it is not feasible to isolate them at home. Also people may still need to go into a health care facility because there are complications arising from their condition, or their treatment. Within a health care facility there may be a need for some separation of people as described below, in order to reduce the chances of transmission. The measures described above also mainly apply to resource poor settings, and the recommendations can be different where more resources are available.

TB prevention in health care facilities

Doctors and other health care workers, who provide care for patients with TB, must follow infection control procedures to ensure that TB infection is not passed from one person to another. Every country should have infection control guidance which clearly needs to take into account local facilities and resources, as well as the numbers of people being provided with care. However, infection control guidance must not only be written but also implemented.

It is not just in resource poor countries that TB transmission occurs in hospitals. In 2012 it was reported that a patient in the UK had become infected with TB and had died, as a result of receiving kidney dialysis while being seated next to another patient with infectious TB.

TB infection control plan

More people living with HIV are attending health-care and community facilities than ever before. People living with HIV are particularly vulnerable to developing TB disease if they become infected with Mycobacterium tuberculosis. This could be due to exposure in these facilities. People with undiagnosed, untreated and potentially contagious TB are often seen in HIV care settings.

Health workers and other staff are also at particularly high risk of TB infection because of frequent exposure to patients with infectious TB disease. Health workers and staff may themselves be immuno-compromised due to HIV infection, and be at higher risk of

developing TB disease once infected.

Each facility should have a written TB infection control plan/protocol that what needs to be done and how in order to prevent TB infection in the facility. The protocol might include the following: prompt recognition of TB, cough hygiene, separation, prompt provision of services, investigation for TB, and fast track of patients with suspected or confirmed TB disease.

The plan should designate a staff member to be the infection control officer who would be responsible for ensuring that TB infection control procedures are implemented in the facility and correct any inappropriate practices or failure to adhere to institutional policies.

Three ways to ensure prevention of TB transmission in your health facility are as follows:

- Administrative Controls
- Environmental Controls
- Use of Personal Protection Equipment (PPE)

ADMINISTRATIVE CONTROLS:
Preventing TB transmission through good patient management:

This is done by rapidly identifying patients with cough, suspected TB and TB disease, and managing them promptly thus preventing the transmission of TB in health-care facilities. There are specific ways in which you can operate in your clinic to ensure that reduce the risk of TB transmission in your facility.

Periodic review of health care policies:

Transmission is most likely to occur from patients with unrecognized pulmonary or laryngeal tuberculosis who are not on effective anti-tuberculosis therapy and have not been placed in tuberculosis isolation. Health-care facilities in which persons at high risk for tuberculosis work or receive care should periodically review their tuberculosis policies and procedures, and determine the actions necessary to minimize the risk of tuberculosis transmission in their particular settings. The prevention of tuberculosis transmission in health-care settings requires that all of the following basic approaches be used:

a) prevention of the generation of infectious airborne particles (droplet nuclei) by early identification and treatment of persons with tuberculosis infection and active tuberculosis, prevention of the spread of infectious droplet nuclei into the general air circulation by applying source-control methods,
b) reduction of the number of infectious droplet nuclei in air contaminated with them, and
c) surveillance of health-care-facility personnel for tuberculosis and tuberculosis infection.

Experience has shown that when inadequate attention is given to any of these approaches, the probability of tuberculosis transmission is increased. Specific administrative actions to reduce the risk of tuberculosis transmission should include:

a) screening patients for active tuberculosis and tuberculosis infection,
b) providing rapid diagnostic services,
c) prescribing appropriate curative and preventive therapy,
d) maintaining physical measures to reduce microbial contamination of the air,
e) providing isolation rooms for persons with, or suspected of having, infectious tuberculosis,
f) screening health-care-facility personnel for tuberculosis infection and tuberculosis, and
g) promptly investigating and controlling outbreaks.

Visual Alerts:

Visual alerts should be posted (in appropriate languages) at the entrance to outpatient facilities (e.g., emergency departments, physician offices, outpatient clinics) instructing patients and persons who accompany them (e.g., family, friends) to inform healthcare personnel of symptoms of a respiratory infection when they first register for care and to practice Respiratory Hygiene/Cough Etiquette.

Respiratory Hygiene/Cough Etiquette in Healthcare Settings:

The following measures to contain respiratory secretions are recommended for all individuals with signs and symptoms of a respiratory infection.

- ✓ Cover your mouth and nose with a tissue when coughing or sneezing;
- ✓ Use the nearest waste receptacle to dispose off the tissue after use;
- ✓ In case, you don't have access to tissues, cough into your elbow;
- ✓ Do not share kerchiefs or tissues.

Following this, hand hygiene should be performed, i.e., hand washing with soap and water, alcohol-based hand rub, or antiseptic hand wash, after having contact with respiratory secretions and contaminated objects/materials.

Healthcare facilities should ensure the availability of materials for adhering to Respiratory Hygiene/Cough Etiquette in waiting areas for patients and visitors, by:

Providing tissues and no-touch receptacles for used tissue disposal,

Providing conveniently located dispensers of alcohol-based hand rub; where sinks are available,

Ensuring that supplies for hand washing (i.e., soap, disposable towels) are consistently available.

Although completely eliminating the risk of tuberculosis transmission in all health-care settings may be impossible, adhering to these administrative guidelines should minimize the risk to persons in these settings. The infection control guidelines should be prepared in consultation with experts in tuberculosis, acquired immunodeficiency syndrome, infection-control and hospital epidemiology, microbiology, ventilation and industrial hygiene, respiratory therapy, nursing, and emergency medical services.

ENVIRONMENTAL CONTROL:

To prevent the transmission of respiratory infections in healthcare settings, the following infection control measures should be implemented at the first point of contact with a potentially infected person. They should be incorporated into infection control practices as a component of Standard Precautions.

Preventing Spread of Infectious Droplet Nuclei via Source-Control Methods:

In high-risk settings, certain techniques can be applied to prevent or reduce the spread of infectious droplet nuclei into the general air circulation. They are called source-control methods as they entrap infectious droplet nuclei as they are emitted by the patient, or "source". This is especially important during performance of medical procedures likely to generate aerosols containing infectious particles.

1. **Local exhaust ventilation:**

This is a source-control technique that removes airborne contaminants at or near their sources. The use of booths for sputum induction or administration of aerosolized medications (e.g., AP) is an example of local exhaust ventilation for preventing the spread of infectious droplet nuclei generated by these procedures into the general air circulation. Booths used for source control should be equipped with exhaust fans that nearly 100% of airborne particles during the time interval between the departure of one patient and the arrival of the next. The time required for removing a given percentage of airborne particles from an enclosed space depends upon the number of air exchanges per hour, which is determined by the capacity of the exhaust fan in cubic feet per minute (cfm), the number of cubic feet of air in the room or booth, and the rate at which air is entering the room or booth at the intake source.

The exhaust fan should maintain negative pressure in the booth with respect to adjacent areas, so that air flows into the booth. Maintaining negative pressure in the booth minimizes the possibility that infectious droplet nuclei in the booth will move into adjacent rooms or hallways. Ideally, the air from these booths should be exhausted directly to the

outside of the building (away from air-intake vents, people, and animals, in accordance with federal, state, and local regulations concerning environmental discharges). If direct exhaust to the outside is impossible, the air from the booth could be exhausted through a properly designed, installed, and maintained high-efficiency particulate air (HEPA) filter; however, the efficacy of this method has not been demonstrated in clinical settings.

2. General Ventilation:

Ventilation standards for health-care facilities have been published by ASHRAE and by the Federal Health Resources and Services Administration. Meeting these standards should reduce the probability of tuberculosis transmission in clinical settings; however, some highly infectious patients may transmit infection even if these ventilation standards are met.

(a) **Dilution and removal of airborne contaminants**:

Appropriate ventilation maintains air quality by two processes--dilution and removal of airborne contaminants. Dilution reduces the concentration of contaminants in a room by introducing air that does not contain those contaminants into the room. Air is then removed from the room by exhaust directly to the outside or by recirculation into the general ventilation system of the building. Continuously re-circulating air in a room or in a building may result in the accumulation or concentration of infectious droplet nuclei. Air that is likely contaminated with infectious droplet nuclei should be exhausted to the outside, away from intake vents, people, and animals, in accordance with federal, state, and local regulations for environmental discharges.

(b) **Air mixing**:

Proper ventilation requires that within-room mixing of air (ventilation efficiency) must be adequate. Air mixing is enhanced by locating air-supply outlets at ceiling level and exhaust inlets near the floor, thus providing downward movement of clean air through the breathing zone to the floor area for exhaust.

(c) **Direction of air flow:**

For control of tuberculosis transmission, the direction of air flow is as important as dilution. The direction of air flow is determined by the differences in air pressure between adjacent areas, with air flowing from higher pressure areas to lower pressure areas.

In an area occupied by a patient with infectious tuberculosis, air should flow into the potentially contaminated area (the patient's room) from adjacent areas. The patient's room is said to be under lower or negative pressure.

Proper air flow and pressure differentials between areas of a health-care facility are

difficult to control because of open doors, movement of patients and staff, temperature, and the effect of vertical openings (e.g., stairwells and elevator shafts).

Air-pressure differentials can best be maintained in completely closed rooms. An open door between two areas may reduce any existing pressure differential and could reduce or eliminate the desired effect. Therefore, doors should remain closed, and the close fit of all doors and other closures of openings between pressurized areas should be maintained.

For critical areas in which the direction of air flow must be maintained while allowing for patient or staff movement between adjacent areas, an appropriately pressurized anteroom may be indicated.

Examples of factors that can change the direction of air flow include the following:

a) dust in exhaust fans, filters, or ducts,
b) malfunctioning fans,
c) adjustments made to the ventilation system elsewhere in the building, or
d) automatic shutdown of outside air introduction during cold weather.

In areas where the direction of air flow is important, trained personnel should monitor air flow frequently to ensure that appropriate conditions are maintained. Each area to which an infectious tuberculosis patient might be admitted should be evaluated for its potential for spread of tuberculosis bacilli. Modifications to the ventilation system, if needed, should be made by a qualified ventilation engineer. Individual evaluations should address factors such as the risk of tuberculosis among the patient population served, special procedures that may be performed, and ability to make the necessary changes.

Too much ventilation in an area can create problems. In addition to incurring additional expense at marginal benefits, occupants bothered by the drafts may elect to shut down the system entirely. Furthermore, if the concentration of infectious droplet nuclei in an area is high, the levels of ventilation that are practical to achieve may be inadequate to completely remove the contaminants.

2. Potential supplemental approaches: a. **HEPA filtration**:

For general-use areas (e.g., emergency rooms and waiting areas) of health-care facilities, re-circulating the air is an alternative to using large percentages of outside air for general ventilation. If air is re-circulated, care must be taken to ensure that infection is not transmitted in the process.

Although they can be expensive, HEPA filters, which remove at least 99.97% of particles greater than 0.3 microns in diameter, have been shown to be effective in clearing the air of Aspergillus spores, which are in the size range of 1.5-6 microns. The ability of HEPA filters to remove tuberculosis bacilli from the air has not been studied, but tuberculosis-

containing droplet nuclei are approximately 1-5 microns in diameter, about the same size as Aspergillus spores; therefore, HEPA filters theoretically should remove infectious droplet nuclei. HEPA filters may be used in general-use areas, but **should not** be used to re-circulate air from a tuberculosis isolation room back into the general circulation.

Applications in preventing nosocomial Aspergillus infection have included using HEPA filters in centralized air-handling units and using whole-wall HEPA filtration units with laminar air flow in patient rooms. In addition, portable HEPA filtration units, which filter the air in a room rather than filtering incoming air, have been effective in reducing such infections.

These units have been used as an interim solution for retro-fitting old areas of hospitals. Although these units should not be substituted for other accepted tuberculosis isolation procedures, they may be useful in general-use areas (e.g., waiting rooms and emergency rooms) where an increased risk of exposure to tuberculosis may exist, but where other methods of air control may be inadequate.

When HEPA filters are to be installed at a facility, qualified personnel must assess and design the air-handling system to assure adequate supply and exhaust capacity. Proper installation, testing, and meticulous maintenance are critical if a HEPA filter system is used. Improper design, installation, or maintenance could permit infectious particles to circumvent filtration and escape into the ventilation. The filters should be installed to prevent leakage between filter segments and between the filter bed and its frame. A regular maintenance program is required to monitor HEPA filters for possible leakage and for filter loading. A manometer should be installed in the filter system to provide an accurate means of objectively determining the need for filter replacement. Installation should allow for maintenance without contaminating the delivery system or the area served. HEPA-filtered, re-circulated air should not be used if the contaminants contain carcinogenic agents. Qualified personnel should maintain, decontaminate, and dispose of HEPA filters.

b. **Germicidal UV irradiation:**

The use of germicidal UV lamps (wavelengths 100-290 nm) to prevent tuberculosis transmission in occupied spaces is controversial. UV lamps installed in the exhaust air ducts from the rooms of patients with infectious tuberculosis were shown to prevent infection of guinea pigs, which are highly susceptible to tuberculosis. On the basis of this finding, other studies, and the experience of tuberculosis clinicians and mycobacteriologists during the past 2-3 decades, CDC has continued to recommend UV lamps (with appropriate safeguards to prevent short-term overexposure) as a supplement

to ventilation in settings where the risk of tuberculosis transmission is high.

Their efficacy in clinical settings has not been demonstrated under controlled conditions, but there is a theoretical and experiential basis for believing they are effective. Thus, individual health-care facilities may need to consider, on a case-by-case basis, using these lamps in settings with a high risk of tuberculosis transmission. UV lamps are less effective in areas with a relative humidity of greater than 70%. The potential for serious adverse effects of short and long-term exposure to germicidal UV has been identified as a major concern (NIOSH, unpublished report (Health Hazard Evaluation Report, HETA 90-122-L2073)).

The two most common types of UV installations are wall or ceiling-mounted room fixtures for disinfecting the air within a room and irradiation units for disinfecting air in supply ducts. Wall or ceiling-mounted fixtures act by disinfecting upper room air, and their effectiveness depends in part upon the mixing of air in the room. Organisms must be carried by air currents from the lower portion of the room to within the range of the UV radiation from the fixtures. These fixtures are most likely to be effective in locations where ceilings are high, but some protection may be afforded in areas with ceilings as low as 8 feet. To be maximally effective, lamps should be left on day and night.

Installing UV lamps in ventilation ducts may be beneficial in facilities that recirculation the air. UV exposure of air in ducts can be direct and more intense than that provided by room fixtures and may be effective in disinfecting exhaust air. Duct installations provide no protection against tuberculosis transmission to any person who is in the room with an infectious patient.

As with HEPA filters, UV installations in ducts may be used in general-use areas but should not be used to recirculation air from a tuberculosis isolation room back into the general circulation.

The main concern about UV lamps is safety. Short-term overexposure to UV irradiation can cause keratoconjunctivitis and erythema of the skin. However, with proper installation and maintenance, the risk of short-term overexposure is low. Long-term exposure to UV irradiation is associated with increased risk of basal cell carcinoma of the skin and with cataracts. To prevent overexposure of health-care-facility personnel and patients, UV lamp configurations should meet applicable safety guidelines.

When UV lamps are used in air-supply ducts, a warning sign should be placed on doors that permit access to the duct lamps. The sign should indicate that looking at the lamps is a safety hazard. In addition, warning lights outside doors permitting access to duct lamps should indicate whether the lamps are on or off. The duct system should be engineered to prevent UV emissions from the duct from radiating into potentially occupied spaces.

Consultation from a qualified expert should be obtained before and after UV lamps are installed. After installation, the safety and effectiveness of UV irradiation must be checked with a UV meter and fixtures adjusted as necessary. Bulbs should be periodically checked for dust, cleaned as needed, and replaced at the end of the rated life of the bulb. Maintenance personnel should be cautioned that fixtures should be turned off before inspection or servicing. A timing device that turns on a red light at the end of the rated life of the lamp is available to alert maintenance personnel that the lamp needs to be replaced.

Reducing Microbial Contamination of Air:

Once infectious droplet nuclei have been released into room air, they should be eliminated or reduced in number by ventilation, which may be supplemented by additional measures (e.g., trapping organisms by high-efficiency filtration or killing organisms with germicidal ultraviolet (UV) irradiation (100-290 nanometers)). Health-care-facility workers may also reduce the risk of inhaling contaminated air by using PRs.

Although for the past 2-3 decades ventilation and, to a lesser extent, UV lamps and face masks have been used in health-care settings to prevent tuberculosis transmission, few published data exist on which to evaluate their effectiveness and liabilities or to draw conclusions about the role each method should play.

From a theoretical standpoint, none of the methods (ventilation, UV irradiation and high-efficiency filtration) appears to be ideal as a standalone, however, when used with the other infection-control measures outlined in this document; they can substantially reduce the risk.

PERSONAL PROTECTION EQUIPMENT:

Masking and Separation of Persons with Respiratory Symptoms:

During periods of increased respiratory infection activity in the community (e.g., when there is increased absenteeism in schools and work settings and increased medical office visits by persons complaining of respiratory illness), masks should be offered to persons who are coughing.

Surgical masks (with ear loops or ties) may be used to contain respiratory secretions (respirators such as N-95 or above are not necessary for this purpose). When space and chair availability permit, coughing persons should be encouraged to sit at least three feet away from others in common waiting areas. Some facilities may find it logistically easier to institute this recommendation year-round.

Droplet Precautions:

Healthcare personnel should be advised to observe Droplet Precautions (i.e., wearing a surgical mask for close contact), in addition to Standard Precautions, when examining a patient with symptoms of a respiratory infection, particularly if fever is present. These precautions should be maintained until it is determined that the cause of symptoms is not an infectious agent that requires droplet precautions.

A patient's use of a properly fitted surgical mask or disposable, valve less particulate respirator (PR) also may reduce the spread of infectious particles. However, since the device would need to be worn constantly for the protection of others, it would be practical in only very limited circumstances (e.g., when a patient is being transported within a medical facility or between facilities).

Screening health workers for TB and HIV and educating them on TB infection control:

Annual screening programs for TB disease, such as annual chest radiography, have not been shown to effectively reduce the amount of time between developing symptoms and diagnosis, as only a fraction of those who develop TB do so around the time of screening. Instead, reminders that health care workers and other staff can develop TB, regardless of previous infection status or BCG vaccination should occur with annual re-training on infection control.

It is recommended that staff be investigated for TB free of charge if they have a cough for two weeks or more. The infection control plan should list designated staff members who should be contacted to initiate TB investigations, and reinforce that all services are confidential

Tuberculin skin testing can diagnose persons with TB infection who are most likely to develop TB disease, and who could potentially benefit from preventive treatment for TB infection. However, TB preventive therapy programs are not yet widely implemented in resource-limited settings. In the new era of expanding access to care for persons living with HIV, TB preventive therapy for HIV-infected health care workers should be considered.

INCREASING ACCESS TO VOLUNTARY HIV COUNSELING AND TESTING:

Encouraging and enabling health care workers and all staff to know their HIV status should be a priority of all health care services, and HIV care programs, in particular. The rate of HIV infection among health care workers and staff may be similar to that of the

broader community. In the past, stigma, lack of confidentiality, and lack of treatment options have contributed to failure of healthcare workers to know their HIV status. The expansion of the types of facilities is a sign that conditions are changing.

Encouraging and enabling health care workers and all staff to know their HIV status can be facilitated by providing accessible, acceptable, confidential VCT, including periodic retesting, to staff. Policies which prioritize ART for health care workers who need it can motivate them to know their HIV status.

Health care workers are a valuable resource, and they must receive adequate care and treatment to remain healthy and in the workforce. Furthermore, HIV-infected health care workers and other staff are at increased risk of developing TB disease if exposed in the workplace, and additional precautions should be taken to protect them. Immuno-compromised health care workers should be given opportunities to work in areas with a lower risk of exposure to TB.

Community Application of IC practices:

Infection Control in the Community Setting against Potential Exposure to Blood Borne pathogens:

OCCUPATIONAL EXPOSURES:

Healthcare personnel are at risk for occupational exposure to blood borne pathogens, including hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). Exposures occur through needle sticks or cuts from other sharp instruments contaminated with an infected patient's blood or through contact of the eye, nose, mouth, or skin with a patient's blood. Important factors that influence the overall risk for occupational exposures to blood borne pathogens include the number of infected individuals in the patient population and the type and number of blood contacts. Most exposures do not result in infection.

Following a specific exposure, the risk of infection may vary with factors such as these:

a) The pathogen involved
b) The type of exposure
c) The amount of blood involved in the exposure
d) The viral load in the patient's blood at the time of exposure

Many needle sticks and other cuts /exposures, to the eyes, nose, mouth, or skin can be prevented by:

a) using safer techniques (for example, not recapping needles by hand)
b) disposing of used needles in appropriate sharps disposal containers
c) using medical devices with safety features designed to prevent injuries
d) using appropriate barriers such as gloves, eye and face protection, or gowns, when contact with blood is expected.

Post exposure Measures:

1. Immediately following an exposure to blood:

Wash needle sticks and cuts with soap and water
Flush splashes to the nose, mouth, or skin with water
Irrigate eyes with clean water, saline, or sterile irrigates

No scientific evidence shows that using antiseptics or squeezing the wound will reduce the risk of transmission of a blood borne pathogen. Using a caustic agent such as bleach is not recommended.

2. Report the exposure:

The exposure should be reported to the department (e.g., occupational health, infection control) responsible for managing such incidents. Prompt reporting is essential because, in some cases, post exposure treatment may be recommended and it should be started as soon as possible. The possible risks of acquiring HBV, HCV, and HIV and the need for post exposure treatment should be discussed with the provider managing such exposures. The HCWs should have already received hepatitis B vaccine, which is extremely safe and effective in preventing HBV infection.

RISK OF INFECTION AFTER EXPOSURE

HBV:

Healthcare personnel who have received hepatitis B vaccine and developed immunity to the virus are at virtually no risk for infection. For a susceptible person, the risk from a single needle sticks or cut exposure to HBV-infected blood ranges from 6-30% and depends on the hepatitis B e antigen (HBeAg) status of the source individual.

Hepatitis B surface antigen (HBsAg)-positive individuals who are HBeAg positive have more virus in their blood and are more likely to transmit HBV than those who are HBeAg

negative. While there is a risk for HBV infection from exposures of mucous membranes or non intact skin, there is no known risk for HBV infection from exposure to intact skin.

HCV

The average risk for infection after a needle stick or cut exposure to HCV-infected blood is approximately 1.8%. The risk following a blood exposure to the eye, nose or mouth is unknown, but is believed to be very small; however, HCV infection from blood splash to the eye has been reported. There also has been a report of HCV transmission that may have resulted from exposure to non intact skin, but no known risk from exposure to intact skin.

HIV

The average risks of HIV infection after a needle stick or cut exposure to HlV infected blood is 0.3%. The risk after exposure of the eye, nose, or mouth to HIV-infected blood is estimated to be, on average, 0.1% (1 in 1,000).

The risk after exposure of non-intact skin to HlV infected blood is estimated to be less than 0.1%. A small amount of blood on intact skin probably poses no risk at all. There have been no documented cases of HIV transmission due to an exposure involving a small amount of blood on intact skin.

INCIDENCE OF INFECTION AMONG HEALTHCARE PERSONNEL WITH BLOOD-BORNE PATHOGENS:

HBV:

The annual number of occupational infections has decreased 95% since hepatitis B vaccine became available in 1982, from >10,000 in 1983 to <400 in 2001 (CDC, unpublished data).

HCV:

There are no exact estimates on the number of healthcare personnel occupationally infected with HCV. However, studies have shown that approximately 1% of hospital healthcare personnel have evidence of HCV infection. The actual number of workers who may have been infected through an occupational exposure is unknown.

HIV:

As of December 2001, CDC had received reports of 57 documented cases and 138

possible cases of occupationally acquired HIV infection among healthcare personnel in the United States since reporting began in 1985.

TREATMENT AFTER EXPOSURE:

HBV:

Hepatitis B vaccine has been available since 1982 to prevent HBV infection. All healthcare personnel who have a reasonable chance of exposure to blood or body fluids should receive hepatitis B vaccine. Vaccination ideally should occur during the healthcare worker's training period. Workers should be tested 1-2 months after the vaccine series is complete to make sure that vaccination has provided immunity to HBV infection. Hepatitis B immune globulin (HBIg) alone or in combination with vaccine (if not previously vaccinated) is effective in preventing HBV infection after an exposure. The decision to begin treatment is based on several factors, such as:

Whether the source individual is positive for hepatitis B surface antigen

Whether the HCW has have been vaccinated previously

Whether the vaccine taken previously provided sufficient immunity

HCV:

There is no vaccine against hepatitis C and no treatment after an exposure that will prevent infection. Neither immunoglobulin nor antiviral therapy is recommended after exposure. For these reasons, following recommended infection control practices to prevent per cutaneous injuries is imperative.

HIV:

There is no vaccine against HIV. However, results from a small number of studies suggest that the use of some antiretroviral drugs after certain occupational exposures may reduce the chance of HIV transmission. Post exposure prophylaxis (PEP) is recommended for certain occupational exposures that pose a risk of transmission. However, for those exposures without risk of HIV infection, PEP is not recommended because the drugs used to prevent infection may have serious side effects. The risks and side effects should be discussed with the HCW by the healthcare provider before starting PEP for HIV.

HANDLING OF EXPOSURES TO BLOOD FROM AN INDIVIDUAL WHOSE INFECTION STATUS IS UNKNOWN:

HBV–HCV–HIV:

If the source individual cannot be identified or tested, decisions regarding follow-up should be based on the exposure risk and whether the source is likely to be infected with a blood borne pathogen. Follow-up testing should be available to all personnel who are concerned about possible infection through occupational exposure.

DRUG REGIMEN FOR POST EXPOSURE TREATMENT:

HBV:

If the HCW has not been vaccinated, then hepatitis B vaccination is recommended for any exposure regardless of the source person's HBV status. HBIG and/or hepatitis B vaccine may be recommended depending on the source person's infection status, the HCW's vaccination status and, if vaccinated, the HCW's response to the vaccine.

HCV:

There is no post exposure treatment that will prevent HCV infection.

HIV:

The Public Health Service recommends a 4-week course of a combination of either two antiretroviral drugs for most HIV exposures, or three antiretroviral drugs for exposures that may pose a greater risk for transmitting HIV (such as those involving a larger volume of blood with a larger amount of HIV or a concern about drug-resistant HIV). Differences in side effects associated with the use of these drugs may influence which drugs are selected in a specific situation. These recommendations are intended to provide guidance to clinicians and may be modified on a case-by-case basis.

Determining which drugs and how many drugs to use or when to change a treatment regimen is largely a matter of judgment. Whenever possible, consulting an expert with experience in the use of antiviral drugs is advised, especially if a recommended drug is not available, if the source patient's virus is likely to be resistant to one or more recommended drugs, or if the drugs are poorly tolerated.

WHEN TO START POST EXPOSURE TREATMENT:

HBV:

Post exposure treatment should begin as soon as possible after exposure, preferably within 24 hours, and no later than 7 days.

HIV:

Post Exposure Treatment should be started as soon as possible, preferably within hours as opposed to days, after the exposure. Although animal studies suggest that treatment is less effective when started more than 24-36 hours after exposure, the time frame after which no benefit is gained in humans is not known. Starting treatment after a longer period (e.g., 1 week) may be considered for exposures that represent an increased risk of transmission.

SAFETY AND SIDE EFFECTS OF THESE DRUGS:

HBV:

Hepatitis B vaccine and HBIG are very safe. There is no information that the vaccine causes any chronic illnesses. Most illnesses reported after a hepatitis B vaccination are related to other causes and not the vaccine.

HIV:

All of the antiviral drugs for treatment of HIV have been associated with side effects. The most common side effects include upset stomach (nausea, vomiting, and diarrhea), tiredness, or headache. The few serious side effects that have been reported in healthcare personnel using combinations of antiviral drugs after exposure have included kidney stones, hepatitis, and suppressed blood cell production. Protease inhibitors (e.g., indinavir and nelinavir) may interact with other medicines and cause serious side effects and should not be taken in combination with certain other drugs, such as non-sedating antihistamines, e.g., Claritin®. If the antiviral drugs are required to be taken for an HIV exposure, it is important for the HCW to tell the healthcare provider managing the exposure about any medications they may be currently taking.

POST EXPOSURE TREATMENT FOR PREGNANT / LACTATING HEALTHCARE PERSONNEL:

HBV:

Women who are pregnant or breast-feeding can receive the hepatitis B vaccine and/or HBIG. Pregnant women who are exposed to blood should be vaccinated against HBV infection, because infection during pregnancy can cause severe illness in the mother and a

chronic infection in the newborn. The vaccine does not harm the fetus.

HIV:

Pregnancy should not rule out post exposure treatment when it is warranted. If the HCW is pregnant she should understand what is known and not known regarding the potential benefits and risks associated with the use of anti-viral drugs in order to make an informed decision about the treatment.

FOLLOW-UP AFTER AN EXPOSURE:

HBV:

Since post exposure treatment is highly effective in preventing HBV infection, CDC does not recommend routine follow-up after treatment. However, any symptoms suggesting hepatitis (e.g., yellow eyes or skin, loss of appetite, nausea, vomiting, fever, stomach or joint pain, extreme tiredness) should be reported to the healthcare provider. If the HCW receive hepatitis B vaccine, he/she should be tested 1-2 months after completing the vaccine series to determine if the person has responded to the vaccine and is protected against HBV infection.

HCV:

The HCW should be tested for HCV antibody and liver enzyme levels (alanine amino-transferase or ALT) as soon as possible after the exposure (baseline) and at 4-6 months after the exposure. To check for infection earlier, the HCW can be tested for the virus (HCV RNA) 4-6 weeks after the exposure. The HCW should report any symptoms suggesting hepatitis (mentioned above) to their healthcare provider.

HIV:

The Healthcare Worker should be tested for HIV antibody as soon as possible after exposure (base-line) and periodically for at least 6 months after the exposure (e.g., at 6 weeks, 12 weeks, and 6 months).

If antiviral drugs are taken for post exposure treatment, he/she should be checked for drug toxicity by having a complete blood count and kidney and liver function tests just before starting treatment and 2 weeks after starting treatment.

Any sudden or severe flu-like illness that occurs during the follow-up period, especially if it involves fever, rash, muscle aches, tiredness, malaise, or swollen glands should be

reported as these may suggest HIV infection, drug reaction, or other medical conditions.

PRECAUTIONS TO BE TAKEN DURING THE FOLLOW-UP PERIOD:

HBV:

If the HCW is exposed to HBV and is receiving post exposure treatment, it is unlikely that they will become infected and pass the infection on to others. No precautions are recommended.

HCV:

As the risk of becoming infected and passing the infection on to others after exposure to HCV is low, no precautions are recommended.

HIV:

During the follow-up period, especially the first 6-12 weeks when most infected persons are expected to show signs of infection, the recommendations for preventing transmission of HIV should be followed, which include not donating blood, semen, or organs and not having sexual intercourse (if at all there is sexual intercourse, using a condom consistently and reduces the risk of HIV transmission). In addition, lactating mothers should consider not breastfeeding their infants during the follow-up period to prevent the possibility of exposing their infants to HIV that may be in breast milk.

PREVENTION OF OCCUPATIONAL INFECTIONS WITH HBV, HCV, OR HIV:

Hepatitis B virus is largely preventable through vaccination. For HBV, HCV, and HIV, however, preventing occupational exposures to blood is the best way of preventing occupational infections. This includes using appropriate barriers such as gown, gloves and eye protection as appropriate, safely handling needles and other sharp instruments, and using devices with safety features.

To Summarize:

I. Package of interventions for TB-IC in health-care settings:

Organizational activities

1. Identify and strengthen coordinating bodies for planning, development of national guidelines and implementation plan
2. Conduct surveillance and assessment of TB infection risk at all levels of the health system
3. Engage civil society and address advocacy communication and social mobilization
4. Conduct monitoring and evaluation

5. Enable and conduct operational research

Administrative controls

Develop strategies to promptly identify potentially infectious cases (triage), separate them, control the spread of pathogens (cough etiquette) and minimize time in health care settings.

Environmental controls

1. Natural ventilation
2. Mechanical ventilation
3. Ultraviolet germicidal irradiation (UVGI) units
4. Health facility design and renovation

Personal protective interventions

1. Respirators
2. Package of prevention and care for HCWs

I) Package for Infection regarding HIV/AIDS at Health Facilities:

Screening HCWs TB and HIV and educating them on TB infection control:

1. Annual screening programs for TB
2. Annual re-training on infection control
3. Staff be investigated for TB free of charge if they have a cough for two weeks or more.
4. List of designated staff members to be contacted to initiate TB investigations should be displayed
5. All services should be kept confidential.
6. Tuberculin skin testing for diagnosing HCWs who are most likely to develop TB, and who could potentially benefit from preventive treatment for TB infection should be done periodically.
7. TB preventive therapy for HIV-infected health care workers should be provided.

Increasing access to voluntary HIV counseling and testing:

1. Encouraging and enabling health care workers and all staff to know their HIV status.
2. Providing accessible, acceptable, confidential VCT, including periodic retesting, to staff.
3. Policies which prioritize ART for health care workers should be in place.
4. Immuno-compromised health care workers should be given opportunities to work

in areas with a lower risk of exposure to TB.

II) Environmental IC Procedures-health care associated blood borne Infections: Segregation & Disposal of Sharps and Needles:

Infectious Waste Collection and Disposal

The responsibility for infectious waste identification, segregation, and packaging rests with the principal investigator or laboratory supervisor. All infectious waste generated must be properly segregated from other wastes.

Infectious Waste means those solid wastes which may cause human disease and may reasonably be suspected of harboring human pathogenic organisms, or may pose a substantial threat or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed. Types of solid waste designated as infectious include, but are not necessarily limited to, the following:

A. Biological Wastes:

1. **Biological liquid wastes** means blood and blood products, excretions, exudates, secretions, suctioning, and other body fluids including liquid wastes from renal dialysis.
2. **Pathological wastes** means all human tissues and anatomical remains, including human fetal remains, which emanate from surgery, obstetrical procedures, autopsy and laboratory procedures.
3. **Culture and stocks of etiologic agents** and associated biological wastes means, but is not limited to, specimen cultures and stocks of etiologic agents, and wastes from production of biological and serums.
4. **Laboratory wastes** means those wastes which have come in contact with pathogenic organisms or blood or body fluids. Such wastes include, but are not limited to, disposable materials; culture dishes; devices used to transfer, inoculate, and mix cultures; paper and cloth which has come in contact with specimens or cultures which have not been sterilized or rendered noninfectious; or laboratory wastes, including cultures of etiologic agents, which pose a substantial threat to health due to their volume and virulence.
5. **Animal tissue, bedding and other wastes from animals** known or suspected to be infected with a pathogen which also causes human disease, provided that prevailing evidence indicates that such tissue, bedding or other waste may act as a vehicle of transmission to humans.
6. **Human dialysis waste** materials including blood lines and dialysate membranes.

B. Sharps means any discarded article that may cause punctures or cuts. Such wastes include, but are not limited to, needles, intravenous (IV) tubing with needles attached, scalpel blades, glass slides, glassware, and syringes that have been removed from their original sterile containers.

C. Discarded biological means serums and vaccines produced by pharmaceutical companies for human or veterinary use. These products may be discarded because of a bad manufacturing lot (i.e., off-specification material that does not pass quality control or that is recalled), out-dating or removal of the product from the market or other reasons. Because of the possible presence of etiologic agents in these products, the discarded material constitutes infectious waste.

D. Other infectious wastes mean any residue or contaminated soil, water, or other debris resulting from the cleanup of a spill of any infectious waste.

E. Infectious waste that has been sterilized or disinfected by autoclaving or chemical treatment must still be disposed of following the procedures outlined in these guidelines.

Note: Liquid infectious waste may be discarded into the sanitary sewer system, if appropriate.

SEGREGATION AND PACKAGING REQUIREMENTS:

All waste, except sharps and infectious animal carcasses and/or tissues, that is determined to be infectious should first be autoclaved and then placed into a box which is lined with two red infectious waste bags. When the infectious waste box is full, each of the red infectious waste bags should be sealed individually by twisting the top of the bag into a gooseneck and wrapping with a sufficient amount of strong tape (ex. duct tape, packaging tape).

Sharps are to be placed into rigid, puncture-resistant containers supplied by the Department of Environmental Health & Safety. Clipping, breaking and recapping of needles and re-sheathing of scalpels are not recommended in order to prevent aerosols and accidental punctures or cuts. Under no circumstances shall a discarded sharp (used or unused) be removed from a sharps container.

Departments may be authorized by the Department of Environmental Health & Safety to establish a local storage area for waste prior to collection by the disposal company.

ANNEXURES AND WORKSHEETS

ANNEXURE-I Latent TB infection versus TB disease

	TB INFECTION	PULMONARY TB DISEASE
BACTERIA	**M. tuberculosis in the body**	
Tuberculin skin test	**Skin test reaction is usually positive**	
Symptoms	**No symptoms**	**Cough, fever weight loss**
Chest X-ray	**Normal**	**Abnormal**
Sputum smears	**Negative**	**Usually positive**
Infectious?	**Not infectious**	**Often infectious before Treatment**
Classification	**Not a case of TB**	**A case of TB**

Annexure 2: Preventing Transmission through Good Patient Management

Five Steps for Patient Management to Prevent Transmission of TB in HIV Care Settings	
Step	**Action**
1	Screen for suspected or confirmed TB*/HIV
2	Educate on cough hygiene-blood borne disease
3	Separate patients suspected of having TB
4	Provide HIV services
5	Investigate for TB or Refer HIV suspected person

*Although TB patients on adequate treatment are no longer infectious, it may be difficult for the facility to determine if anyone reporting being on treatment for TB has indeed received adequate treatment. The most cautious procedure is to manage those who are on treatment in the manner described.

Step 1: Screen for suspected or confirmed TB

Early **recognition** of patients who have suspected or confirmed TB disease is the first step in the protocol. A staff member should be assigned to screen patients for prolonged duration of cough immediately after they arrive at the facility. Patients with cough should be allowed to enter, register, and receive a card without standing in line with other patients.

Step 2: Educate on cough hygiene

During screening, patients who are suspected to have TB must be given advice on **cough hygiene** (also called cough etiquette) that is, they must cover their mouths and noses when coughing. They should be provided with a face mask (e.g. surgical mask) or tissues to cover their mouths and noses. If neither is available, advise them to raise their arm and use the inside of their elbow to cover their mouth and nose when coughing.

Face masks help prevent the spread of M. tuberculosis from the patient to others. The face

mask can capture large wet particles near the patient's mouth and nose, preventing the bacteria from being released into the environment. Face masks could be provided to people who show positive symptoms until they leave the facility. Cloth masks can be sterilized and reused. Face masks do not protect those wearing them from inhaling M. tuberculosis. Actually, the use of these masks may contribute to a false sense of security.

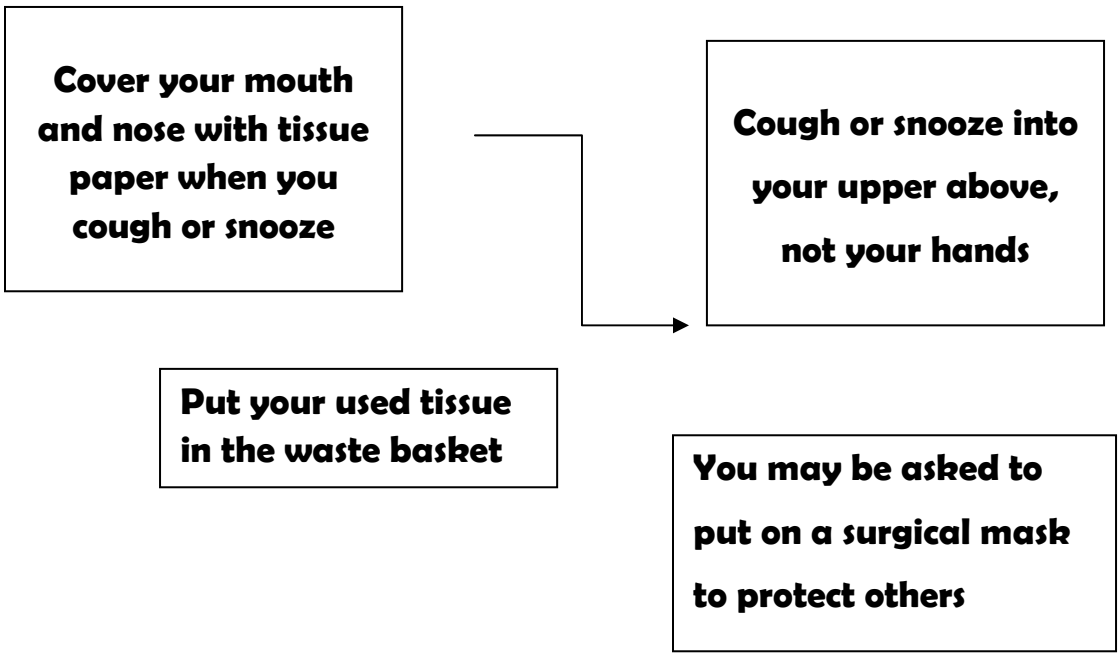
It is less costly to provide paper tissues to these patients, with instructions to cover their mouths and noses when coughing or sneezing. People suspected of having TB and using paper tissues will be less conspicuous and therefore less likely to suffer stigma. However, paper tissues are also less likely to be used effectively.

Tissues and face masks should be disposed of in waste receptacles. Clients and especially staff should be encouraged to wash their hands after contact with respiratory secretions. M. tuberculosis cannot be spread from the hands, but other lung infections can. This is why it is advisable to use the inside of the elbow rather than the hand to cover the mouth and nose if a tissue or cloth is not available.

Step 3: Separate patients suspected of having TB

Patients suspected of having TB should then be removed from the presence of other patients and requested to wait in a **separate** well-ventilated waiting area. A sheltered open-air space is ideal in warm climates

(Suggested Display showing Cough Hygiene/Etiquette)



Step 4: Provide services

It is recommended that symptomatic patients be placed at the front of the line in order to quickly provide care and reduce the amount of time that others are exposed to them.

Speed up the diagnosis and management of people with TB and those suspected of having TB so that they spend as little time as possible at the facility.

Some patients with symptoms suggestive of TB may have attended the clinic for another reason. If possible, these patients should **receive the services** they were originally trying to obtain (e.g. VCT, HIV care, medication refills, etc.) before being investigated for TB, or they should be referred for TB diagnosis. In an integrated service delivery setting, if possible, the patient should receive the services they are there to obtain before TB investigation begins.

Step 5: Investigate for TB or refer

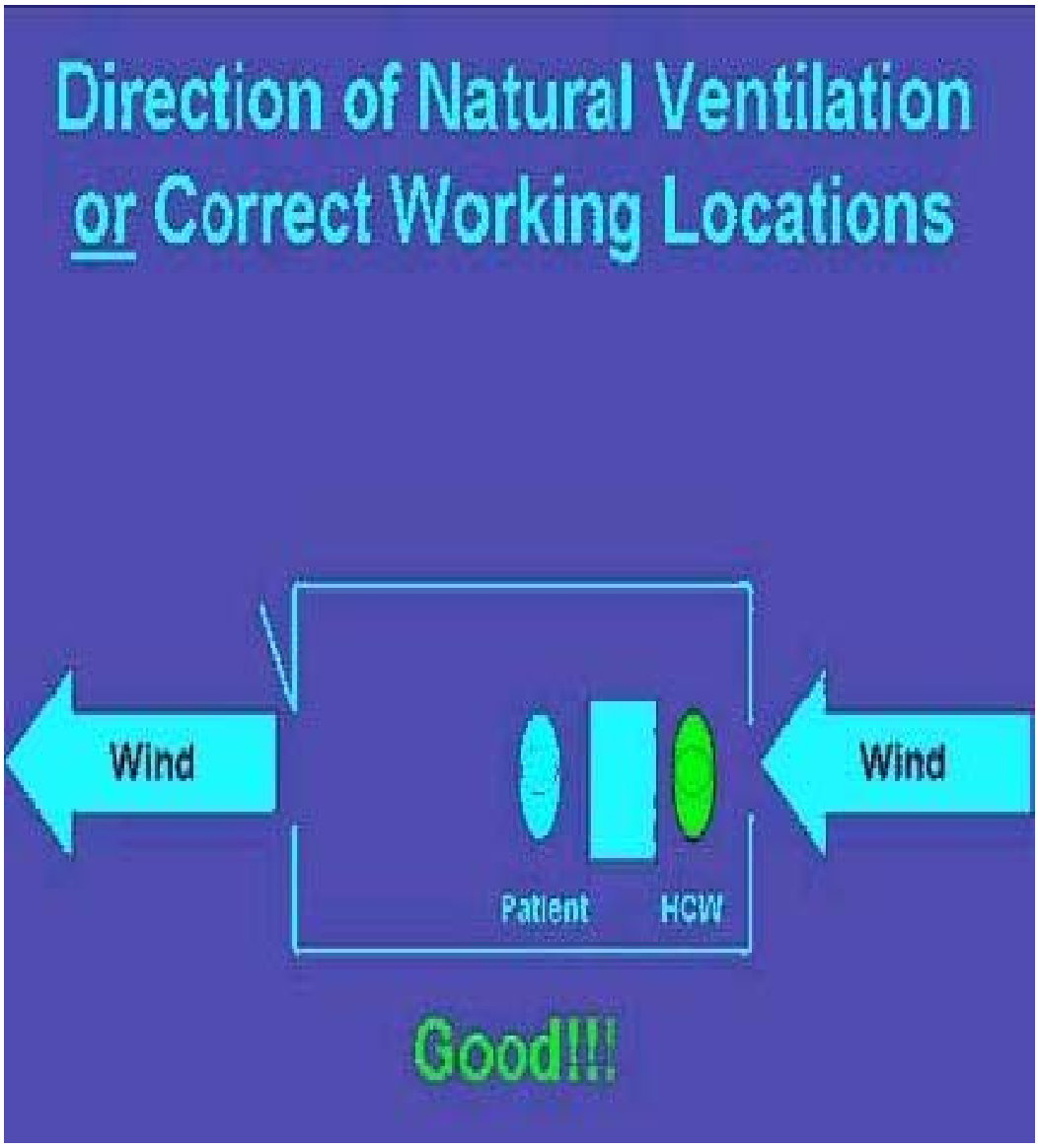
People suspected of having TB should promptly be **investigated** for it by following national protocols. If TB diagnostic services are not available onsite, the facility should have an established link with a TB diagnostic centre to which patients with symptoms can be **referred.**

Ideally, sputum samples should be collected and sent to the nearest laboratory. Sputum collection always should be done in a designated area with plenty of air circulation and away from other people. It should not be done in small rooms such as toilets or other enclosed areas. If this is not possible, the patient should be referred to the nearest TB diagnostic centre.

Every attempt should be made to facilitate this referral (e.g. through subsidizing transport costs or providing incentives) as further delays in diagnosis will increase the risk of exposing others to TB infection.

Ensure rapid diagnostic investigation of people suspected of having TB, including referring them to TB diagnostic services if these are not available on site. Ensure that that people on TB treatment adhere to it.

Annexure 2: Ventilation and Airflow

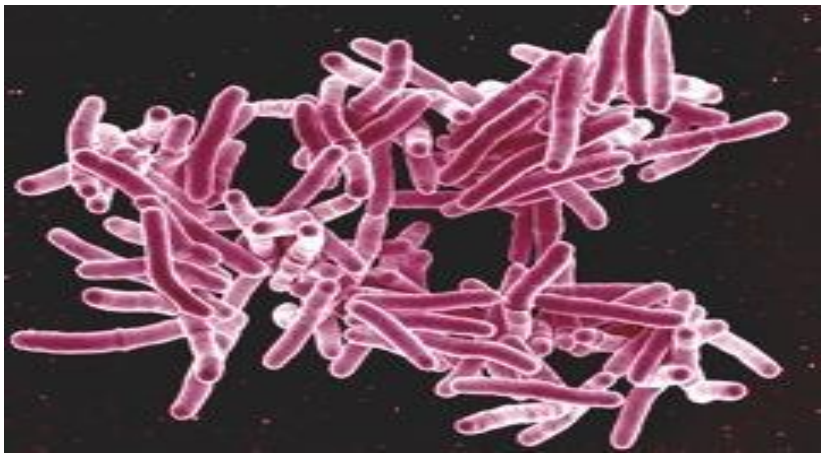

Direction of Natural Ventilation
or Correct Working Locations
Wind
Wind
Patient
HCW
Good!!!

ANNEXURE 3

TB diagnostic tests

These are TB tests which can be used to determine if someone has latent TB, which means that they are infected with TB bacteria. There are also TB tests, which when considered alongside other factors, such as whether someone has symptoms of TB, can confirm a diagnosis of active TB or TB disease. Even if a person has symptoms, TB is often difficult to diagnose, and is particularly difficult to diagnose rapidly, which is what is needed to provide effective TB treatment for drug resistant TB.

Evidence of TB bacteria



TB tests look for evidence of Mycobacterium tuberculosis

The development of TB disease is a two stage process. In the first stage, known as latent TB, a person is infected with TB bacteria. In the second stage, known as active TB or TB disease, the bacteria have reproduced sufficiently to usually cause the person to become sick.

A diagnosis of active TB can only be confirmed when there is definite evidence of TB bacteria in the person's body. Some of the TB diagnostic tests look directly for TB bacteria. Others such as the chest X-ray look for the effect of the bacteria on the person suspected of having TB.

Current TB tests - some problems

Some of the current TB tests take a long time to obtain a result, and some are not very accurate. The TB tests either have low sensitivity (the ability to correctly detect people with TB) and/or low specificity (the ability to correctly detect people who haven't got TB).

If a TB test has low sensitivity, it means that there will be a significant number of "false negatives", meaning that the test result is suggesting that a person has not got TB when they actually have. Similarly, a low specificity means that there will be a significant number of "false positives" suggesting that a person has TB when they actually haven't.

Chest X-ray as a TB test

Acute pulmonary TB can be easily seen in an X-ray. However, the picture it presents is not specific and a normal chest X-ray cannot exclude extra pulmonary TB. Also, in countries where resources are more limited, there is often a lack of X-ray facilities.

The TB skin test

The TB skin test is a widely used diagnostic TB test, and in countries with low rates of TB it is often used to test for latent TB infection. The problem with using it in countries with high rates of TB infection is that the majority of people may have latent TB.

A health care worker measures the size of the reaction to the tuberculin skin test

The TB skin test involves injecting a small amount of tuberculin (purified protein derivative – PPD) into the skin in the lower part of the arm. Then the person must return after 48 to 72 hours to have a trained health care worker look at their arm. The health care worker will look for a raised hard area or swelling, and if there is one then they will measure its size. The result depends on the size of the raised hard area or swelling; larger the size of the affected area, the greater the likelihood that the person has been infected with TB bacteria at some time in the past. Interpreting the TB skin test result, may also involve considering the lifestyle factors of the person being tested for TB. They cannot tell if the person has latent TB or active TB disease. The Mantoux TB test is the most common type of TB skin test used, although the Heaf and Tine tests are still used in some countries.

None of these TB tests though **guarantee** a correct result. False positive results happen because the person has been infected with a different type of bacteria, rather than the one that causes TB. It can

also happen because the person has been vaccinated with the BCG vaccine,and this vaccine is widely used in countries with high rates of TB infection. False negative results particularly happen with children, older people and people with HIV.

TB Interferon gamma release assays (IGRAs)

The Interferon Gamma Release Assays (IGRAs), are a new type of more accurate TB test.

T-SPOT® TB Test

IGRAs are blood tests that measure a person's immune response to the bacteria that cause TB. The immune system mounts a complex response to TB bacteria, and produces some special molecules called cytokines. These assays work by detecting a cytokine called the interferon gamma cytokine. Two IGRAs that have been approved by the U.S. Food and Drug Administration (FDA), and are commercially available in the U.S., are the QuantiFERON® TB Gold test, and the T-SPOT® TB test.

The advantages of an IGRA TB test include the fact that it only requires a single patient visit to conduct the TB test, results can be available within 24 hours, and prior BCG vaccination does not cause a false positive result.

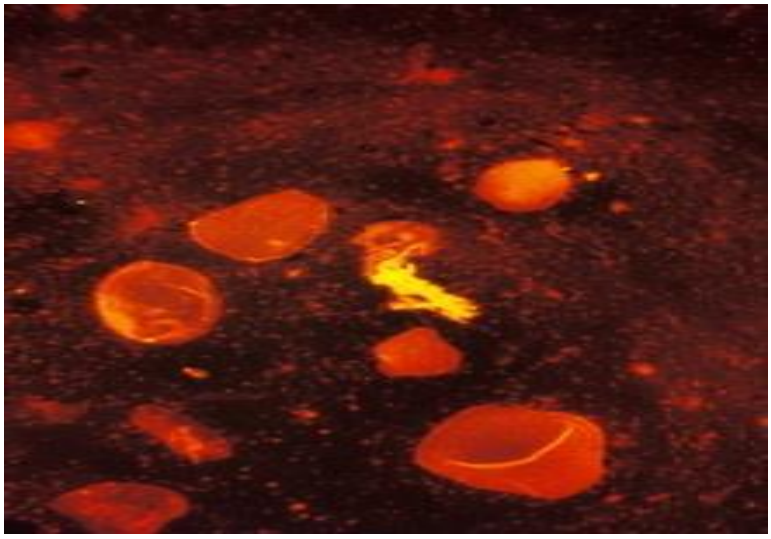
Disadvantages include the fact that the blood sample must be processed fairly quickly, laboratory facilities are required, and the test is for latent TB. It is also thought that the IGRAs may not be as accurate in people who have HIV. In low prevalence resource rich settings, IGRAs are beginning to be used in place of the TB skin test. They are not very useful in high prevalence resource limited settings.

Serological tests for TB

Serological tests for TB are carried out on samples of blood, and claim to be able to diagnose TB by detecting antibodies in the blood. However, testing for TB by looking for antibodies in the blood is very difficult.

As a result serological tests, sometimes called serodiagnostic tests, for TB are inaccurate and unreliable, and the World Health Organization has warned that these tests should not be used to try and diagnose active TB. Some countries have banned the use of serological or serodiagnostic tests for TB. Serological tests for TB are very different from the IGRA tests described above.

Sputum smear microscopy as a test for TB



A sputum smear stained using fluorescent acid fast stain and being used as a test for TB

Smear microscopy of sputum is often the first TB test to be used in countries with a high rate of TB infection. Sputum is a thick fluid that is produced in the lungs and the airways leading to the lungs, and a sample of sputum is usually collected by the person coughing.

For the diagnosis of TB, several samples of sputum are normally collected. Historically it has been recommended that three sputum specimens are collected on two consecutive days, but in 2007 the World Health Organization (WHO) recommended that just two specimens could be examined from consecutive days. Now it has been suggested that two specimens can be collected on the same day without any loss of accuracy.

To do the TB test a very thin layer of the sample is placed on a glass slide called a smear. A series of stains are then applied to the sample, and the stained slide is examined under a microscope for signs of the TB bacteria.

Sputum smear microscopy is inexpensive and simple, and people can be trained to do it relatively

quickly and easily. In addition, the results are available within hours. The sensitivity though is only about 50-60%. In countries with high prevalence of both pulmonary TB and HIV infection, the detection rate can be even lower, as many people with HIV and TB co-infection have very low levels of TB bacteria in their sputum, and are therefore recorded as sputum negative.

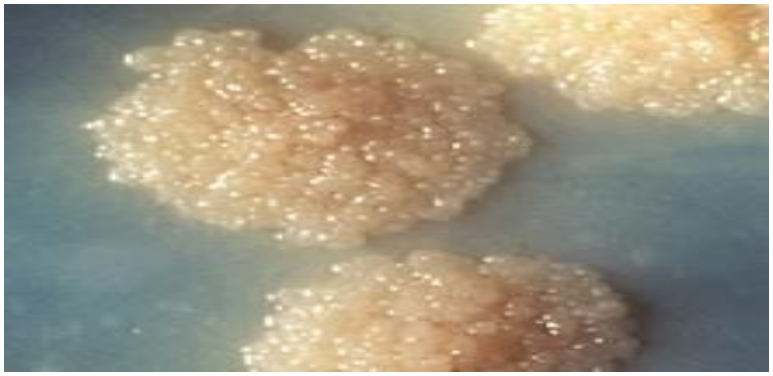
Fluorescent microscopy

The use of fluorescent microscopy is a way of making sputum TB tests more accurate. With a fluorescent microscope the smear is illuminated with a quartz halogen or high pressure mercury vapour lamp, allowing a much larger area of the smear to be seen and resulting in more rapid examination of the specimen.

One disadvantage though is that a mercury vapour lamp is expensive and lasts a very short time. Such lamps also take a while to warm up, they burn significant amounts of electricity, and electricity supply problems can significantly shorten their life span. One way of overcoming these problems is the use of light emitting diodes (LEDs). These switch on extremely quickly, have an extremely long life, and they don't explode.

In 2011 the World Health Organization issued a policy statement recommending that conventional fluorescence microscopy should be replaced by LED microscopy. It also recommended that in a phased way, that LED microscopy should replace conventional Ziehl-Neelsen light microscopy.

Using culture to test for TB



Colonies of Mycobacterium tuberculosis growth on a culture plate

ulturing is a method of studying bacteria by growing them on media containing nutrients. Media can be either solid on culture plates or culture tubes or bottles of liquid media (culture broths). Different media are used to make it as easy as possible for the suspected microorganisms to grow.

To isolate a single bacterial species from a mixture of different bacteria, solid media are normally

used. Individual cells dividing on the surface do not move away from each other as they would do in liquid, and after many replications they form visible colonies composed of tens of millions of cells all derived from a single cell.

Culturing and identification of M. tuberculosis provides a definitive diagnosis of TB and can significantly increase the number of cases found. Culture can also provide drug susceptibility testing, showing which TB drugs a person is resistant to, i.e. is the person infected by MDR or XDR TB organisms. However, culture is much more complex and expensive than microscopy to perform as it requires specific equipment and enhanced laboratory facilities.

Diagnosing TB using culture can also take weeks because of the slow growth of TB bacilli. It averages at 4 weeks to get a conclusive test result using the most common methods of solid media, with another 4-6 weeks to produce drug susceptibility results.

On the other hand, liquid culture media can provide conclusive test results in 15-20 days and drug susceptibility results within 10-15 days, but these media are prone to a high level of contamination.

Drug susceptibility testing means testing to find out which drugs the TB bacteria in a patient are susceptible to, and can therefore determine whether the person has got drug resistant TB.

Molecular tests for drug resistance testing:

Some tests, such as the Line Probe Assay and the Cartridge Based Nucleic Acid Amplification Test (CBNAT / X-pert TB test) can be used to diagnose TB, as well as testing for some types of TB drug resistance.

To summarize:

Diagnosing TB, and in particular diagnosing drug resistant TB, promptly and accurately, remains a significant challenge, particularly in resource poor settings. Although new TB tests are becoming available, they are generally too expensive for developing countries and also require significant laboratory facilities, including the availability of highly trained staff. This results in delays in providing patients with the appropriate drug treatment, and contributes to the ongoing global TB epidemic. There is a sore need for a simple, cheap, point of care TB diagnostic test and an economic molecular TB test for drug resistance.

ANNEXURE 4

Recommending screening of health workers for TB and HIV and educating them on TB infection control

Do not ignore symptoms in yourself or your colleagues in the health facility.

Health workers and all other staff working at the facility should be educated about signs and symptoms of TB and be encouraged to seek care if they develop symptoms and signs which suggest TB.

In the absence of symptoms, screening with a chest X-ray has proved ineffective.

The best approach is to screen by accepted methods and respond promptly to symptoms.

All staff should be trained and educated on TB and the TB infection control plan in the health-care setting.

Health workers and other staff should be informed and encouraged to undergo HIV testing and counseling, and should be given information on relevant HIV-care resources.

ANNEXURE 5

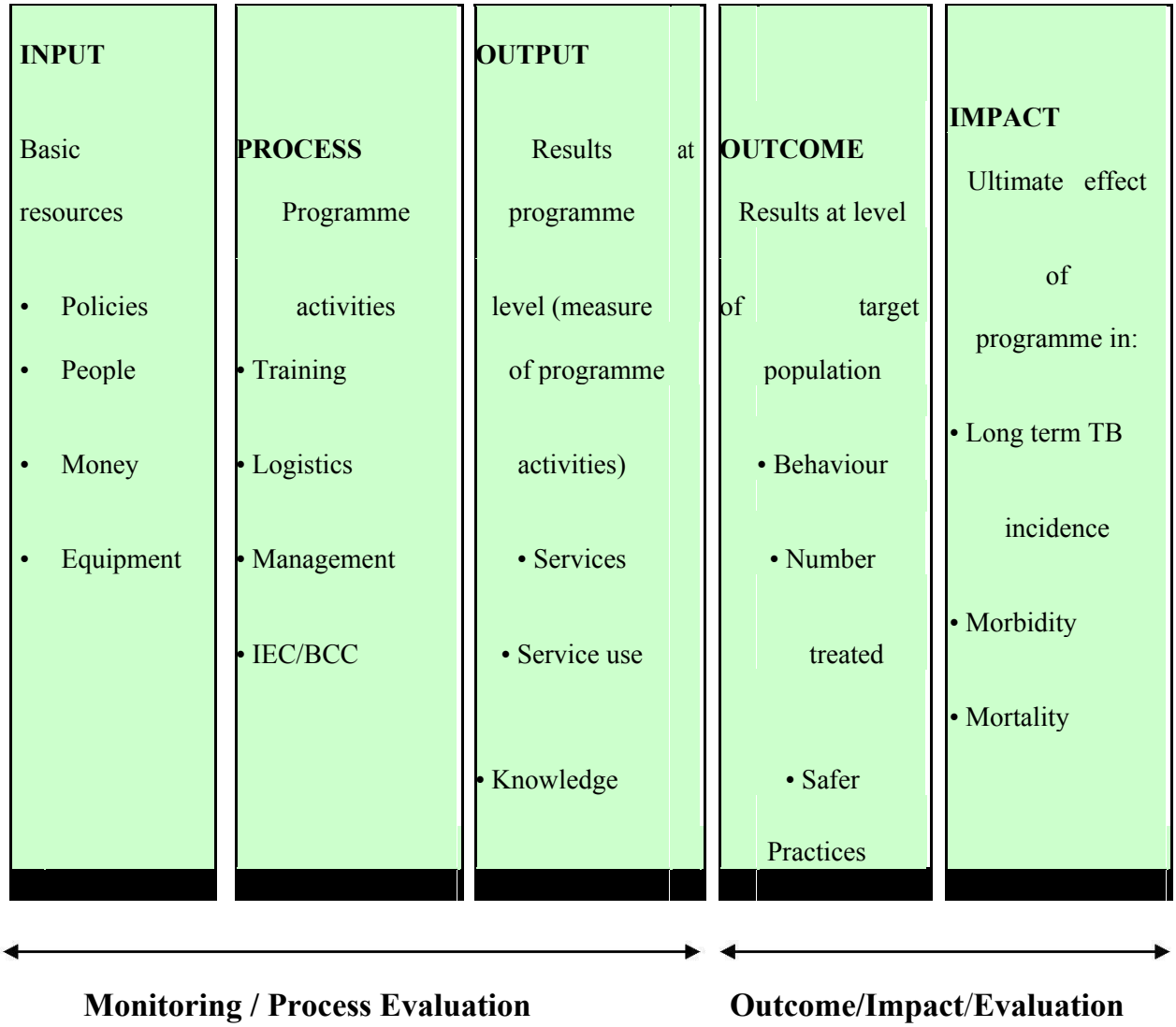
Strategic Framework for TB Infection Control

Aim: Minimal transmission of M. Tuberculosis infection in high risk settings, including high HIV prevalence settings.

Objective: Appropriate TB-IC controls implemented in all health facilities, congregate settingsand households

M&E framework for Infection Control

CONTEXT
Environmental, cultural, political, socio-economic factors external to the programme



ANNEXURE 6

Indicator Matrix for infection control in health care and congregate settings

No.	Indicator	Definition	Indicator Type
Administrative Controls			
IF1	Infection Control Plan developed and available	# of health care facilities and/or congregate settings with a written infection control plan, expressed as a proportion of the total number of health care facilities and congregate settings Evaluated	Process
IF2	Functional Infection Control Committees	# / % of districts with functional Infection Control Committees	Process
IF3	Infection Control Committee meetings	# of meetings held by district Infection Control Committees	Process
IF4	Active Screening and Case Detection	# / % of health facilities and congregate settings with system for active cough screening blood test for HIV and case detection in place (cough registers available)	Process
IF5	Risk of infection among HCW's	#/% of HCWs in health facilities and congregate settings diagnosed with TB or HIV	Impact

IF6	CNR of TB disease	# of TB cases detected per 100,000 in general population vs. notification rate in HCW's # Separate register for HCW-HIV testing and result	Impact
IF7	Health workers trained in Infection Control	# / % of HCWs trained in Infection Control	Process
IF8	Health facilities with trained staff in Infection Control	# / % of health facilities and congregate settings with health care workers trained in infection control	Process
Environmental (Engineering) Controls			
IF9	AFB Isolation Facilities	# / % of health facilities and congregate settings with AFB isolation or separation facilities (adequate ventilation) for admitted suspected or confirmed TB cases	Process + Outcome
Personal Protection Controls			
IF10	Ensure Protection strategy	# / % of health facilities and Congregate settings with N-95masks/condoms available all the time with no stock outs reported	Process

WORKSHEETS

1. Which of the following can be used/advised for cough hygiene (tick all that apply)

a. Cloth or paper mask (surgical mask)
b. Tissue
c. Old cloth
d. Covering mouth and nose with patient's forearm
e. Covering mouth and nose with patient's hand

2. Rate each case according to the likelihood of transmitting TB. A rating of 3 means the person poses the highest risk of transmitting TB. A rating of 1 means the person poses the least risk of transmitting it.

a. Post-partum woman bringing child for immunization, coughing since delivery due to undiagnosed TB
b. A person suspected of having TB
c. TB patient on treatment for three months using DOT
d. Three-year-old child with newly diagnosed pulmonary TB
e. Patient with TB meningitis (no other site)
f. Patient with sputum smear-negative pulmonary TB
g. Patient with pneumonia returns for sputum results; sputum was AFB positive
h. Unknown patient coughing for three weeks, first visit, not covering mouth

3. Rate each according to risk of TB transmission (3 - greatest risk; 1 - least risk)

Patient management improvement to reduce risk of transmission	Open window Open door Window fan
Mechanical ventilation	Move people suspected of having TB to front of line
Natural ventilation	Speed up diagnosis of TB Make sure patients adhere to TB treatment
Cough Hygiene/Etiquette	Waiting room outside without walls
	Provide tissues for coughing patients

a. A room with an open window, open door, and a window fan
b. Enclosed room with an open window, but door is kept shut; no window fan
c. Enclosed room with no window fan or open window

d. Enclosed room with window, door and window fan, but the window and door are shut during clinic hours.

4. Draw lines to categorize the interventions.

5. Mark each statement as "True" or "False" and explain why.
   a) Coughing patients should be sent to the toilet to produce sputum samples

   b) A face mask (surgical type) worn by a coughing patient with TB can help prevent TB transmission.

   c) A face mask (surgical type) worn by a healthy health worker is a good way to prevent TB transmission.

   d) Never send coughing patients outside to produce a TB sputum sample.

   e) There is only risk of TB transmission in adult medical and TB clinics.

6. What could be improved in the clinical exam room to reduce the health care worker's risk of being infected with TB ?

8. What is the difference between a face mask and a respirator?

Clinical Sessions: TB infection prevention assessment and plan

- ✓ Your facilitator will guide you through a half-day clinical session. The purposes of the out patient clinic session is for participants to be able to:

- ✓ Assess the outpatient department setup of the health facility with regard transmission of TB

- ✓ Recommend a TB infection prevention plan

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