

IMPLEMENTING

**TB** Infection Control  
in health care facilities



## **Pilot Edition; February 2009**

Kerrigan McCarthy, Thabo Mosendane and Mercia Tellie wrote the document and provided technical information.

Melanie Pleaner and Arthi Ramkissoon edited the document and made valuable suggestions

Maria Sibanyoni, Winnie Moleko, Francois Venter, Regina Osih reviewed and commented on the concept, and the draft.

PEPFAR and USAID provided financial support for design, layout and publishing of material

City of Johannesburg public health administrators facilitated piloting of material in primary health care facilities, and reviewed the draft.

Manik Design did the design and layout +27 11 482 3040



# Implementing TB Infection Control in health facilities

RHRU HIV Management Cluster

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# Preface

The objective of the HIV Management Clusters of the Reproductive Health and HIV Research Unit (RHRU) is to support the public sector to ensure access for all South Africans to quality HIV care. Currently, HIV Management Cluster activities consist of the provision of technical assistance, training and development of innovative models of service delivery that are appropriate for the South African context. All activities are intended to strengthen and complement existing public sector services. The high TB/HIV co-infection rate, the high mortality amongst TB patients who are HIV-infected and the poor TB cure rates amongst HIV+ persons have challenged existing TB and HIV service delivery models. RHRU has responded by developing integrated and collaborative TB services and by focusing on TB prevention, including intensified case finding and INH prophylaxis. TB infection control interventions are addressed with this manual entitled: 'Implementing TB infection control in public health facilities'.

## What are the sources for interventions described in this manual?

All interventions described in this manual are based on the National Department of Health guidelines issued in June 2007 entitled "National infection prevention and control policy for TB, MDR-TB and TB, June 2007".

## What is the role of this manual?

This manual should be provided as the reference text at a TB infection control training workshop. The workshop should be held on site at the public health facility where TB infection control is to be implemented. Ideally, two workshops should be held, an initial 3 hour workshop, followed by a second one hour workshop 4-6 weeks later.

## Objective of the manual and workshop

At the workshop, participants will use the manual to:

- acquire a basic understanding of TB infection control principles,
- write a draft TB infection control plan,
- initiate TB infection control in their facility and
- set up an evaluation framework for the monitoring of infection control.

## Which facilities will benefit from TB infection control workshops using this manual?

All public health facilities where clients may present with TB symptoms, whether diagnosed or undiagnosed should implement TB infection control measures. This includes primary health care (PHC) facilities, secondary and tertiary hospitals. In large facilities specific clinics or wards may implement infection control interventions using this manual independently from other areas in the hospital. Staff of these facilities or areas will benefit from training using this manual.

## Who should attend the training workshops?

- The facility manager or clinic/ward manager (ie the person with final administrative control for the facility or section)
- The infection control nurse or nurse designated to be responsible for TB infection control in the facility/area
- Any number of nursing staff and ward assistants
- Administrative staff
- Security personnel who stand at the entrance of the facility/ward
- General assistants.

## What is covered in the manual?

- **Section 1** provides a theoretical overview of the microbiology and epidemiology of TB and HIV. It gives the background necessary to understand why activities to prevent TB are necessary.
- **Section 2** explains the principles of TB infection control; namely creating an enabling environment to implement TB infection control activities, administrative controls, environmental controls and personal protection.
- **Section 3** explains how to assess TB infection control in a facility and provides a one page 'TB infection control assessment tool' or check-list to use for this purpose.
- **Section 5** provides a step-by-step approach to implementing infection control measures. These steps should be done during the training course. As the steps are followed, the facility (or ward) 'TB infection control plan' is drawn up. Section 4 also contains tools required to monitor maintenance of equipment, HCW screening and in-service training.
- **Section 6** contains information, education and communication material pertaining to TB infection control that is required for use in facilities. These IEC material are available separately as posters.

## What are fact sheets and how can they be used?

Fact sheets provide detailed information regarding a specific aspect of TB infection control. Fact sheets may be used independently from the manual. For example, a fact sheet could be photocopied and used as the basis for an in-service training session. There are eight fact sheets covering the following areas:

- An overview of infection control
- Infectious TB particles
- Approaches to the control of TB
- A summary of the natural history of TB
- Ventilation and TB infection control
- Ultraviolet germicidal irradiation
- N95 face masks
- MDR/XDR TB and infection control.

## Introduction

Tuberculosis in South Africa is on the increase: The reported incidence of tuberculosis in the City of Johannesburg for the year 2007-8 is 542/100,000 for all TB forms and 328/100,000 for pulmonary TB<sup>1</sup>. The rate in South Africa is probably around 900/100,000, as many cases go unreported or undiagnosed. Amongst TB patients tested for HIV, the HIV prevalence is over 70%<sup>2</sup>. Case reviews of clients attending inner city tertiary hospital HIV clinics estimate that 30-40% of clients have had or are currently receiving treatment for TB<sup>3</sup>.

Although tuberculosis cure rates in South Africa have improved markedly over the last few years, it is quite clear that treatment programmes alone are insufficient to control or reduce the burden of TB disease. TB disease should if possible be prevented. Mortality due to TB disease in people living with HIV infection will not be reduced simply by treating TB. The WHO Stop TB Strategy published in 2006 emphasizes collaboration between TB and HIV programmes in order to effect TB prevention (amongst other things). WHO Stop TB programme's TB prevention strategies include the 'Three I's' of TB prevention':

- Intensified case finding for TB,
- Isoniazid (INH) prophylactic therapy (IPT) for prevention of TB amongst people living with HIV
- Infection control for prevention of TB.

These three interventions will result in improvements in the National TB Control Programme (NTBCP) (through improved case finding and, decreased numbers of TB cases) and in care for people living with HIV/AIDS (by early diagnosis and prevention of TB).

This manual focuses on efforts to improve TB infection control in public health facilities. Nosocomial transmission of TB is a problem in South Africa as shown by the information below. We will do well to implement TB infection measures in all our facilities in South Africa.

- Nurses in Gauteng have a prevalence rate of latent TB infection in excess of 47%<sup>4</sup>
- Medical students in Gauteng had a documented incidence of TB infection of 5.6 cases/100 person years observation (using tuberculin skin testing) and 13 cases/100,000 person-years observation<sup>5</sup> using gamma interferon release assay.
- Nursing students in Harare had an incidence of TB infection of 19.3 cases /100 person-years observation (range 13-26 cases/100 person-years observation) compared with non-health-care students' rate of 6 cases/100 person-years observation<sup>6</sup>
- Facility based transmission of TB was documented at Sizwe Hospital in Gauteng in 1998 when 6 patients acquired a more resistant strain of TB while undergoing in-patient treatment for drug-resistant TB. The strains were shown to be identical by molecular techniques<sup>7</sup>.
- XDR-TB was shown to be transmitted to in-patients in an MDR-TB treatment centre in Tugela Ferry in KZN in 2008<sup>8</sup>.

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### Footnotes

<sup>1</sup> Estimated from electronic TB register data, City of Johannesburg, courtesy Ms Antonia Barnard.

<sup>2</sup> Electronic TB data register, year 2007-8.

<sup>3</sup> RHRU Monitoring and Evaluation Unit, courtesy Ambereen Jaffer.

<sup>4</sup> Unpublished data, T Mosendane.

<sup>5</sup> Unpublished data, K McCarthy.

<sup>6</sup> Corbett L. et al. CID 2007;44:317-23

<sup>7</sup> Sacks LV et al. A comparison of outbreak- and non outbreak-related MDR tuberculosis among human immunodeficiency virus-infected patients in a South African hospital. Clin Infect Dis. 1999 Jul;29(1):96-101.

<sup>8</sup> Andrews et al. Exogenous reinfection as a cause of multidrug-resistant and extensively drug-resistant tuberculosis in rural South Africa. J Infect Dis. 2008 Dec 1;198(11):1582-9.

## Notes

# 1

An Overview of the Epidemiology, Microbiology  
and Control of Tuberculosis as it pertains to TB  
Infection Control



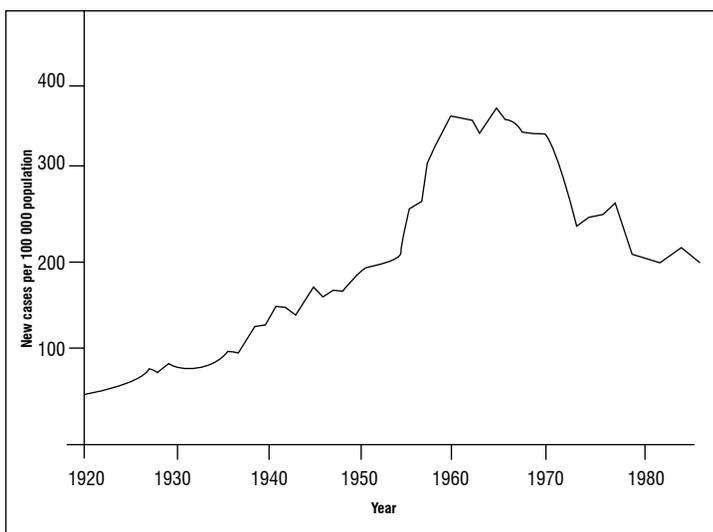
# An overview of the microbiology, epidemiology and control of tuberculosis as it pertains to TB infection control

Tuberculosis has reached epidemic proportions in South Africa, with our country being reported by the WHO as having the fourth highest TB incidence (new TB cases) in the world. According to the WHO report 'Global Tuberculosis Control 2008'<sup>1</sup>, in the year 2007, one percent of South Africans were receiving treatment for tuberculosis; 454,000 new cases of TB were identified and 105,000 people died from TB.

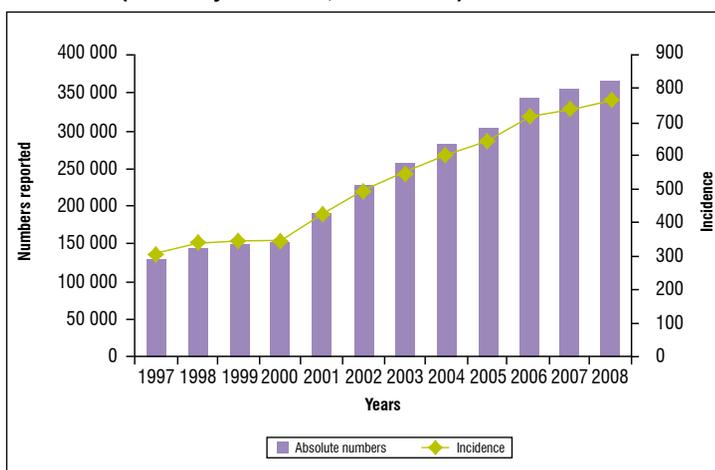
## Epidemiology of tuberculosis

Historically, tuberculosis was imported into our country in the late 1800's. During the first half of the 1900's conditions in the mines, the migrant labour system and the lack of effective chemotherapy facilitated the spread of TB within our country<sup>2</sup>. After 1950, the TB incidence declined with the introduction of isoniazid and rifampicin therapy (Figure 1). However complacency in management of TB over the last 30 years of the 20th century and the emergence of HIV infection contributed to the resurgence of TB disease both within South Africa (Figure 2) 1) and on the African continent (Figure 3). According to WHO<sup>1</sup>, the AFRO region of the WHO had an incidence of 363 cases of tuberculosis/100,000 population in 2007, while South Africa reported 940 cases/100,000.

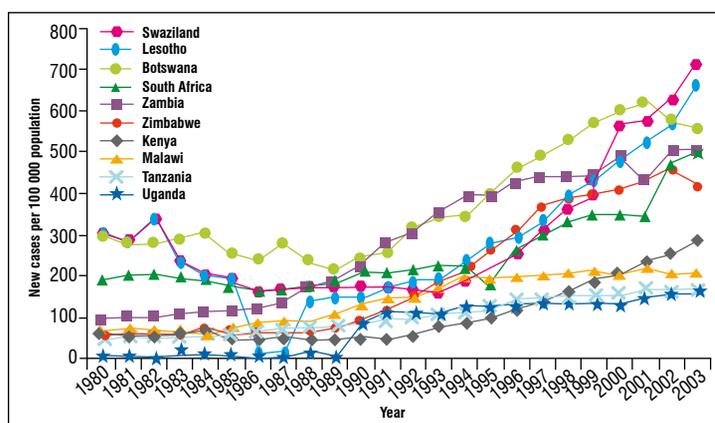
**Figure 1. The incidence of tuberculosis in South Africa, 1900 – 1960<sup>2</sup>**



**Figure 2. TB notifications to Department of Health; (courtesy L. Mvusi, June 2009)**



**Figure 3. Time trends in reported TB incidence in various sub-Saharan African Countries<sup>3</sup> 1980-2000**



### Microbiology of tuberculosis

Tuberculosis is caused by the organism *Mycobacterium tuberculosis*. The disease tuberculosis has been known since antiquity; cases of tuberculosis of the spine are depicted in ancient Egyptian murals<sup>1</sup>. Tuberculosis was discovered to be caused by the bacterium by Robert Koch, who in the 1880's developed the Ziehl Neelsen staining technique to visualize the organism using a light microscope.

*M. tuberculosis* is a small (0.8x4µm) gram-positive bacterium, which has a waxy cell wall containing mycolic acid. The waxy cell wall makes staining with conventional stains difficult, and so the Ziehl Neelsen stain is used to visualize the organisms. The waxy cell wall also protects the bacterium from the human immune system by preventing destruction from reactive oxygen radicals generated by host defence cells (including macrophages and monocytes). *M. tuberculosis* divides slowly – it has a generation time of up to 8 hours, while ordinary bacteria (like *E. coli* which live in our gastro-intestinal tract) take up to 20 minutes to replicate.

### Pathogenesis of tuberculosis

Tuberculosis is transmitted by the airborne route, through infectious particles liberated from diseased persons (see Fact sheet, 'Infectious TB particles'). Infection with *M. tuberculosis* occurs when bacteria are inhaled. (see Fact sheet, 'The natural history of tuberculosis'). Infection with TB leads to latent (dormant) TB infection. Reactivation or rapid growth months or years later can lead to TB disease. Pulmonary tuberculosis is the most common form of TB disease. TB disease outside of the lungs is known as extra-pulmonary TB. Almost any organ can be affected, but common sites include the brain (TB meningitis), the liver and bone.

Defence against tuberculosis is mediated by macrophages and activated cytotoxic T lymphocytes. CD4 cells play a critical role in defence against TB, therefore HIV-positive persons are at risk for TB disease. The annual incidence of TB disease after latent TB infection is 10 times greater than that amongst HIV-negative persons; the lower the CD4 cell count, the greater the risk for disseminated TB, and death due to TB. TB disease in HIV positive persons also causes more rapid progression of HIV infection, and so the two diseases make each other worse.

### Treatment of TB

Tuberculosis is treated with an intensive phase of four drugs for two months (isoniazid (INH), rifampicin (RIF), pyrazinamide (PYZ) and ethambutol (ETH)) followed by two drugs for four months (INH and RIF). These drugs are available in fixed dose combination tablets. Patients take an appropriate number of tablets for their weight. Treatment is usually supervised daily in the intensive phase, and weekly or fortnightly in the continuation phase.

## MDR and XDR-TB

MDR stands for 'multi-drug resistant TB' and refers to strains which are resistant to rifampicin and isoniazid (INH). XDR stands for 'eXtremely drug-resistant TB' and refers to strains which are resistant to rifampicin and isoniazid (i.e. it is already an MDR strain), and resistant to fluoroquinolones and one of the following injectable drugs: kanamycin, amikacin or capreomycin. Resistance to TB drugs occurs naturally in TB strains, but is usually very rare. When TB treatment is taken correctly drug resistance will not develop. Until recently in South Africa, the TB control programme was poorly supervised. This led to the development and spread of drug resistance. Today, a person can get drug-resistant TB (MDR or XDR) in the following ways:

- TB drug-resistance in newly diagnosed TB patients usually occurs when a person is infected with a resistant strain of TB
- TB drug-resistance in previously treated TB patients occurs when a person has been poorly adherent to TB treatment.

Infection control in areas where MDR and XDR TB patients are treated is important to prevent Health Care Workers (HCW) from developing nosocomial MDR-TB.

## Control of tuberculosis

At the core of TB control are three biomedical interventions:

- Prevention of infection with TB and prevention of development of TB disease (by childhood immunization with BCG, infection control and INH preventive therapy)
- Early diagnosis of TB (by intensified case finding, rapid laboratory turnaround time and development of better diagnostic strategies and assays)
- Treatment of TB with an appropriate regimen of drugs active against *M.tuberculosis*.

However, simply providing appropriate treatment (drugs) is insufficient to decrease tuberculosis at a population level. Tuberculosis control requires intensive, co-ordinated effort by a whole range of individuals and institutions involved in health care provision. Over the years, the DOTS strategy has been developed to provide a framework for public health tuberculosis control programmes to use in the fight against TB (see Fact Sheet, 'Approaches to control of TB'). More recently the 'Stop TB Strategy' (which incorporates DOTS) was developed in 2006 by the WHO<sup>4</sup> in order to assist countries to reach Millennium Development Goals related to TB (specifically Goal 6, Target 8: Indicator 23 and 24; to decrease the 'prevalence and death rates associated with tuberculosis' and the 'proportion of tuberculosis cases detected and cured under DOTS').

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### References:

1. WHO. Global Tuberculosis Control 2008. Surveillance, planning, financing. Geneva, Switzerland. WHO/HTM/TB/2008.393
2. Coovadia HM, Benatar S. (Eds) A Century of tuberculosis: South African perspectives. Cape Town. Oxford (University) press. 1991
3. Corbett EL, Marston B, Churchyard G, De Cock K. Tuberculosis in sub-Saharan Africa: opportunities, challenges, and change in the era of antiretroviral treatment. Lancet 2006;367:926-37
4. WHO. The Stop TB strategy. Geneva, Switzerland. WHO/HTM/TB/2006.368

# Notes

# 2

## Principles of Infection Control for TB



# Principles of infection control for TB

## Introduction

On account of higher exposure to TB than the general population, HCW have a higher incidence of latent (dormant TB), and active TB (TB disease). According to a review by Joshi *et al*<sup>1</sup>, the prevalence of latent TB among healthcare workers in low and middle income countries is 54% (ranging from 33% to 79%). In a study by Corbett *et al*<sup>2</sup>, new TB infections (ie latent TB infections) were documented to occur at a rate of 19.3 per 100 person years (95% CI 14.2-26) in 159 Zimbabwean nursing students. This rate was more than six times higher than the rate in non-health care students observed for the same time period. Unpublished data from Johannesburg medical students reveals an incidence rate of 13/100 new TB infections per annum over 2008. Regarding TB disease, HCW in the Western Cape were recorded as having over 1180 cases of TB disease/100,000 HCW<sup>3</sup>.

All these figures reveal that it is critically important to implement TB infection control interventions in the health care setting.

### Strategies to reduce workplace (and nosocomial) transmission of tuberculosis:

From an understanding of the biology of TB (Section 1 and the Fact sheets), it is clear that the strategies to prevent TB transmission in health care institutions should have a three-fold aim. They should:

- Reduce the production of infectious TB aerosols in the local environment. These interventions are called '**administrative controls**'.
- Eliminate infectious TB aerosols once they are generated. These interventions are called '**environmental controls**'.
- Decrease or prevent inhalation of infectious TB particles by staff and clients, and minimize these individual's risk of developing reactivation TB. These interventions are called '**personal risk reduction**'.

### Creating an enabling environment to facilitate implementation of TB infection control interventions:

In order to implement the above three principles of TB infection control, several other requirements are necessary. These requirements facilitate creation of an enabling environment in which biological interventions above can be implemented. They are:

- **Administrative support for TB infection control**  
Administrative commitment to implementation of TB infection control is necessary within facilities to ensure success of TB prevention efforts. Hospital or clinic administrators including the highest administrators from nursing services, and public works, principal medical officers and cleaning services should be aware of the risks to themselves and their staff on account of TB transmission. These staff should be committed to reducing the risk of TB through implementation of these measures. An Infection Prevention and Control Committee should be formed to co-ordinate activities amongst different facility services.
- **The Infection Prevention and Control Committee**  
This committee is a multidisciplinary group which at primary health care level should comprise the facility manager, all professional nurses including the TB control programme nurse or nursing assistant, a person responsible for general cleaning and maintenance, reception area staff (clerks, security personnel) and if possible, the municipal public works officer who has responsibility for the facility. For members at tertiary hospital level, refer to NDOH Infection control guidelines<sup>4</sup>.

The responsibilities of the Infection Prevention and Control committee are:

- To meet monthly
- To produce and update a TB Infection Control Plan (see below, and section 5)
- To review quality of TB infection control in the facility
- To ensure ongoing staff training in TB infection control
- To make any changes to ensure TB infection control is implemented.
- To ensure that finances and budgets allow for implementation of infection control interventions. These may include costs of shelters for outside waiting areas, fans to circulate air and ultraviolet germicidal irradiation units. At PHC level, this function requires liaison with regional managers. If immediate funding is not available, donor funds may be sought to effect changes.

- The TB Infection Control Plan**  
 This document will outline the strategy used by the facility to implement TB infection control interventions. It will detail exactly what should be done to make TB infection control a reality. The plan should cover the following aspects of infection control; Co-ordination of TB Infection Control (including details of the infection prevention and control committee); Administrative controls, Environmental controls; Personal risk reduction. The plan will also name the person responsible for each intervention. The document should be updated regularly to accommodate for staff changes. A draft TB infection control plan will be drawn up during this workshop as part of Section 5.
- Training of staff in TB infection control interventions**  
 All staff, including professional nurses, doctors, cleaners, security guards and pharmacists should be aware of the details of the infection control plan. This will include awareness of the need for early diagnosis of TB risk reduction by awareness of their own and patient's HIV status as well as administrative strategies in place to reduce generation of infectious TB aerosols.
- Education of community in TB awareness and TB prevention.** Awareness of TB symptoms by members of the community leads to better health seeking behaviour and a shorter time-to-diagnosis. This in turn reduces spread of TB and improves TB control. Community liaison initiatives should include education regarding awareness of TB symptoms. Within the facility, health promotion talks, posters and leaflets which facilitate TB awareness should be available.
- Facilitating TB/HIV collaboration.** Because TB patients are more likely to be HIV positive, and because HIV positive persons are more likely to acquire TB, it is important that HIV testing be made easily accessible to all people (HCW and facility clients) undergoing TB screening. For more detail on TB/HIV collaboration, refer to RHRU's Integrated TB/HIV Services Manual<sup>5</sup>. Implementation of TB/HIV collaboration should be lead by the facilities manager.

### Administrative control strategies to reduce the production of infectious TB particles in health care facilities:

Strategies to reduce production of infectious TB particles rely on the identification of clients who cough. This can be done by asking clients for a history of cough, or by observing clients. The sooner coughing clients are identified, the better. Client confidentiality should be maintained, and a gentle approach is advised.

- Screening of clients for cough as they enter the facility**  
 This is best done in the reception area. A staff member should be assigned responsibility for this task. Clients should be asked in a gentle manner if they cough. A poster promoting client disclosure of coughing should be placed in a prominent position in the reception area.
- Education of clients in cough hygiene**  
 All coughing clients should be informed that TB is spread by coughing and in their own interests and those of their fellow clients and staff, be requested to cough into tissues or their elbow, and not their hand or into the air.
- Provision of masks/tissues to coughing clients as they enter the facility**  
 Coughing into masks or tissues traps droplets from a cough, and prevents generation of droplet nuclei which can spread TB. Clients should be asked to dispose of these tissues or masks into appropriate receptacles in waiting areas. Additional supplies of masks or tissues should be placed in waiting areas. Regular and timeous ordering of masks/tissues is necessary to ensure an uninterrupted supply. Ordinary 'surgical' masks are sufficient to trap droplets. N95 respirator/masks are for healthcare workers only (see Fact sheet : 'N95 respirator/masks').
- Separation of clients who cough from those who don't (triaging)**  
 Waiting areas and if possible a separate queue should be made to allow separation of clients who cough from those who don't. Clients who cough should be directed to the appropriate area as they enter the facility.
- Reduction of waiting times for clients who cough**  
 Consider establishing a separate queue and waiting area to ensure short waiting times for clients who cough. The longer clients are present in the facility, the more infectious particles will be generated. If clients are not triaged into separate waiting areas, HCW should regularly review the queue to ensure that clients who cough are seen first. Posters in the waiting area should encourage disclosure of coughing status, and indicate that waiting times will be shorter. This will minimize client frustration when coughing clients appear to 'jump' the queue.
- Early referral and investigation for TB of clients who are coughing**  
 When cough is not the primary reason for visiting the health care facility, and clients require services other than investigation of cough (e.g. family planning etc), they should receive these first (with minimal waiting time) and then be investigated for cough. HCW should be familiar with how to diagnose TB in HIV positive clients who have negative smears. (Refer to RHRU Intergrated TB/HIV Services Manual)
- Provision of a safe environment for collection of sputum**  
 All sputum collection should be done in a safe environment; the safest environment is out-doors. Give the client access to a private space to cough sputum, and to running water for hand washing afterwards. Sputum booths (similar to voting booths) may provide privacy in a public environment.

## Environmental control strategies to eliminate infectious TB particles in health care facilities:

- **Well ventilated waiting areas for clients**  
Waiting areas for all clients should be chosen on the basis of the degree of ventilation available in that area. Natural ventilation is always better than mechanical ventilation (air conditioning), so an outside waiting area is best. Public works officials should assist with provision of a covered area in case of rain, heat or sun.
- **Maintenance of good air circulation by opening windows and use of fans in waiting areas and consultation rooms**  
Inside waiting areas should be well ventilated through the opening of windows. Air mixing should be maintained – this can be done through natural means (air current through wind etc) or mechanically through fans. The mixing of air is critical to ensure that all air has equal change of being vented to the outside. When air is still, pockets of air may contain higher numbers of infectious droplets, and therefore increase risk to clients.
- **Use of ultraviolet germicidal radiation (UVGI) units**  
If finances permit, UVGI units are a useful companion intervention to administrative controls and ventilation. These should be installed in waiting areas and consultation rooms. (see Fact sheet 'Ultraviolet germicidal irradiation').

## Personal risk reduction strategies to reduce the inhalation of infectious TB particles by staff and clients present in health care facilities:

- **Use of N95 respirator/masks to prevent inhalation of TB**  
N95 respirator/masks are useful where strategies to limit production of infectious aerosols are only partially effective. Use by staff who see TB suspects and patients and clients who cough is appropriate. Correct use of the masks is essential; (see Fact sheet :'N95 respirator/masks'). A policy on the use of N95 masks can be drawn up and included in the TB infection control plan.
- **Encouraging clients and staff to know their HIV status, and to take INH prophylaxis if appropriate.**  
It is possible to reduce the risk of TB in HIV-positive persons by taking INH prophylaxis. Staff and clients should be encouraged to know their status. Clear referral mechanisms for staff should be provided so that confidentiality can be observed; it is not appropriate for staff to undergo HIV testing at their place of work. Facility managers should keep an up-to-date list of referral options for staff HIV testing.
- **Training in infection control strategies**  
Regular training sessions (in-service training) should be conducted to ensure that staff understand the principles of TB infection control, and the institution's TB infection control plan.

## Summary: TB infection control interventions

### Supportive interventions to implement TB infection control:

- Formation of an Infection Control and Prevention Committee
- Training of staff in TB infection control interventions
- Education of the community in TB/HIV awareness and prevention
- TB/HIV collaborative activities

### Administrative controls reduce the production of infectious TB particles in health care facilities:

- Screening of clients for cough as they enter the facility
- Education of clients in cough hygiene
- Provision of masks/tissues to coughing clients as they enter the facility
- Separation of clients who cough from those who don't
- Reduction of waiting times for clients who cough
- Early referral and investigation of clients who are coughing for TB
- Provision of a safe environment for collection of sputum

### Environmental controls eliminate infectious TB particles in health care facilities:

- Well ventilated waiting areas for clients
- Maintenance of good air circulation by opening windows and use of fans in waiting areas and consultation rooms
- Use of ultraviolet germicidal radiation

### Personal risk reduction to reduce the inhalation of infectious TB particles by staff and clients, and reduce risk for TB disease:

- Use of N95 respirator/masks to prevent inhalation of TB
- Encouraging clients and staff to know their HIV status, and to take INH prophylaxis if appropriate
- Training in infection control strategies

#### References:

1. Joshi R et al. Tuberculosis among Health-Care Workers in Low- and Middle-Income Countries: A Systematic Review. PLoS Med 3(12): e494 doi:10.1371/journal.pmed.0030494, 2006.
2. Corbett EL et al. Nursing and community rates of Mycobacterium tuberculosis infection among students in Harare, Zimbabwe. C in Infect Dis. 44(3):317-23, 2007.
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3

Fact Sheets



# Fact sheets



## Fact Sheet: An overview of Infection Control Measures

### What is infection control?

Infection control refers to the interventions required to prevent the transmission of microorganisms from infected or colonized patients to other patients and health care workers. Infection control measures are based on an understanding of how different diseases are transmitted<sup>1</sup>.

Types of infection control precautions include:

**Standard precautions** which should be applied regardless of disease or type of institution.

**Transmission-based precautions** which should be applied in specific circumstances depending on transmission routes of various diseases.

### What are Standard or Universal Precautions?

These are precautions which should always be applied when dealing with patients. These precautions include

- Hand washing and antisepsis
- The use of personal protective equipment (e.g. gloves)
- Appropriate handling of patient care equipment and soiled linen
- Prevention of needlestick/sharp injuries
- Environmental cleaning and spills management
- Appropriate handling of waste.

### How are different diseases transmitted?

Diseases caused by microorganisms (bacteria and viruses) are transmitted by three different routes:

**The airborne route:** Microorganisms are transmitted by droplet nuclei, or on dust particles both of which are  $<5\mu\text{m}$  in diameter<sup>2</sup>. These particles are small enough to be deposited directly in the alveoli. Microorganisms transmitted by this route include<sup>1</sup>:

- Tuberculosis
- Measles
- Varicella zoster virus.

**The droplet route:** Larger droplets containing microorganisms which cause infection when deposited on the upper airway epithelium are spread by this route. These include agents of:

- Meningitis (E.g. *Neisseria meningitidis*)
- Pneumonia (E.g. *Streptococcus pneumoniae*)
- The common cold virus.

**The contact route:** These organisms can be spread by direct (person to person) or indirect (touching objects or surfaces in the patient's environment) contact. Examples of these organisms include:

- *Staphylococcus aureus*
- Agents of diarrhoea
- Lice and scabies.

### What are airborne precautions?

These precautions prevent or reduce transmission of organisms by droplet nuclei. Measures include:

- **Administrative controls** (strategies to reduce generation of infectious particles)
- **Environmental controls** (strategies to eliminate infectious particles)
- The use of **personal protective equipment** and HCW **risk reduction** techniques (strategies to reduce exposure to infectious particles).

### What are droplet precautions?

Droplets larger than  $5\mu\text{m}$  do not remain in the air and do not travel long distances. Special air handling is not necessary. Patients and HCW should wear standard surgical masks, and maintain Universal Precautions.

### What are contact precautions?

Barrier methods, (gloves, gowns and handwashing) prevent transmission of organisms transmitted by contact.

**TB infection control relies on the principles of airborne precautions**

### Which precautions should be applied in primary health care facility settings?

- **Universal precautions:** these should ALWAYS be implemented
- **Transmission precautions:** Primary Health Care (PHC) facilities see TB suspects, and therefore all PHCs should have **airborne precautions** in place. Droplet and contact precautions should be implemented where patients present with specific identified or suspected diseases which are transmitted by these routes (e.g. pneumonia, or skin infections).

#### References:

1. For further information, consult WHO 'Practical guidelines for infection control in Health Care Facilities' available on the South African Department of Health website <http://www.doh.gov.za/docs/factsheets/guidelines/infection/part1.pdf>
2. One micrometer is 1/1000th of a millimeter



## Fact Sheet: Global Approaches to the Control of TB

### What biomedical interventions are required to control TB?

**Prevention of TB** by prevention of latent infection and prevention of development of TB disease (by childhood immunization with BCG, infection control and INH preventive therapy)

**Early diagnosis of TB** by intensified case finding, rapid laboratory turnaround time and development of better diagnostic tests

**Treatment of TB** with appropriate drugs active against *Mycobacterium tuberculosis* for the correct length of time.

### Why is there a need for public health programmes to control TB?

It is not sufficient to provide the biomedical interventions listed adjacent at public health facilities. We need public health programmes for the control of TB because:

- The burden of TB disease is enormous
- Patients with TB disease are infectious in the community for a long time and spread TB to others before seeking healthcare
- The consequences of untreated TB are terrible, for example TB meningitis which causes permanent brain damage
- TB requires special drugs to be taken for long periods of time.

### What is the **DOTS** strategy for control of TB?<sup>1</sup>

DOTS is a system of TB control developed by the WHO in the early 1990s to maximize TB control. DOTS stand for Directly Observed Therapy Short-course. DOTS has been implemented with success in many countries. DOTS focuses on 5 major areas:

- **Provision of increased and sustained financing** at appropriate levels because of political commitment to TB control
- **Case detection** through quality-assured bacteriology including smear microscopy and culture
- **Standardized treatment** with supervision and patient support, hence the name DOTS
- **Effective drug supply** and management system
- **Monitoring and evaluation system** to measure impact and intervene early.

### How can we prevent TB infection and TB disease?

The diagnosis and treatment of TB disease will not on its own control the TB epidemic. We need also to prevent new TB infections. Prevention of TB can be done using the three 'I's of TB prevention. These are part of the WHO STOP TB STRATEGY

#### THREE 'I's of TB prevention

- **INH prophylactic therapy** – INH (a TB drug) given for 6 months to people living with HIV infection who are well, without TB disease can prevent reactivation of latent TB
- **Intensified case finding** – early detection of new cases of TB will reduce the number of secondary cases that each infectious case generates
- **Infection control** – prevents new infections by reducing the risk of acquiring TB in health care institutions.

### But...**DOTS** will not do it!<sup>2</sup>

In spite of DOTS, the burden of TB continues to rise in many countries– critics of the DOTS system say this is because DOTS fails in the following areas:

- It neglects TB/HIV co-infection
- It neglects drug-resistant TB
- It neglects TB prevention.

In recognition of the above criticisms, the WHO and partners produced the 'STOP TB STRATEGY'<sup>3</sup> in 2006. This strategy has six components:

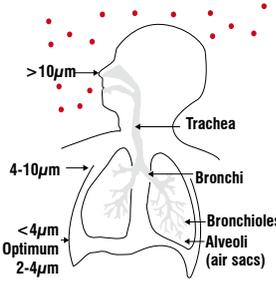
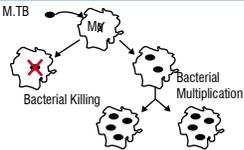
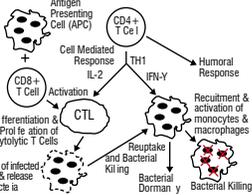
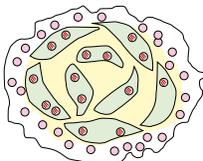
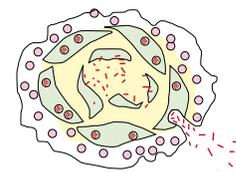
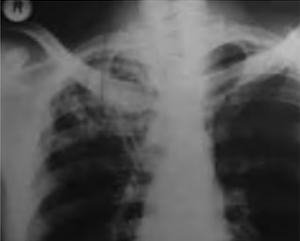
- Expand and improve quality of DOTS
- Address TB/HIV, MDR-TB and other challenges
- Contribute to health system strengthening
- Engage all care providers
- Empower and educate people with TB, and communities
- Enable and promote TB research.



#### References:

1. WHO. Global Tuberculosis Control 2008. Surveillance, planning, financing. Geneva, Switzerland. WHO/HTM/TB/2008.393.
2. De Cock KM, Chaisson RE. Will DOTS do it? A reappraisal of tuberculosis control in countries with high rates of HIV infection
3. WHO. The Stop TB strategy. Geneva, Switzerland. WHO/HTM/TB/2006.368.

## Fact Sheet: A summary of the Natural History of TB

Time after exposure	TST <sup>1</sup>	Sputum smear/culture	TB symptoms <sup>3</sup>	Relative Frequency		Stage (picture)	Stage (description)
				Amongst 20 HIV+ persons	Amongst 20 HIV- persons		
Day 0	N <sup>2</sup>	N <sup>2</sup>	A <sup>4</sup>	20	20		<p><b>Inhalation of infectious TB particles</b></p> <p>Droplet nuclei are deposited in the alveoli of the lungs (see Fact sheet 'Infectious TB particles')</p> <p>The following factors determine whether infection follows inhalation of infectious TB particles</p> <p><b>Host factors:</b></p> <ul style="list-style-type: none"> <li>• Host immunity</li> <li>• Previous exposure to TB</li> <li>• Immunisation with BCG</li> </ul> <p><b>Organism factors:</b></p> <ul style="list-style-type: none"> <li>• Virulence of the organism</li> <li>• Concentration of infectious particles</li> <li>• Length of exposure time</li> </ul>
Day 0-7	N	N	A	5-10	5-10		<p><b>Stage 1</b></p> <p>Alveolar macrophages ingest TB bacilli, which continue to grow intracellularly.</p>
Day 7-21	N	N	A	5-10	5-10		<p><b>Stage 2</b></p> <p>Alveolar macrophages drain to hilar lymphnodes and release cytokines which attract inflammatory mediators.</p>
Week 3	P	N	A	5-10	5-10		<p><b>Stage 3</b></p> <p>TB granulomas form, intracellular killing of TB bacteria occurs following stimulation by Thelper1 activated T cells. TB bacilli which survive are contained within granulomas.</p>
Week 4-12	P	P/N	P	1 (see footnote 7)	<1		<p><b>Stage 4 (Primary TB) - if it occurs</b></p> <p>Bacilli grow logarithmically and escape granulomas. Host defence leads to necrosis. Caseous material in granulomas which spreads into bronchi. Bronchogenic infection causes symptoms of pneumonia.</p>
Months to Years	P	N	A	5-10 <sup>3</sup>	5-10		<p><b>LATENT TB</b></p> <p>TB granulomas contain dormant TB bacilli. No symptom of TB are present. The TST will be positive</p>
Months to Years	P	P/N	P	1-2 per year	1 per lifetime		<p><b>REACTIVATION TB</b></p> <p>Breakdown of granuloma in hila of lung occur, leading to cavity formation and TB symptoms.</p>

## Footnotes:

1. TST = tuberculin skin test; An extract from TB (PPD) is injected into the skin. A skin reaction occurs if a person is infected with TB.
2. N = Negative
3. TB symptoms are any of fever, loss of weight, cough for more than two weeks.
4. A = Absent
5. Some people are able to eradicate the TB bacillus using their innate immune system. In this case, macrophages (and the adaptive immune system) never meet the TB bacillus. In this case, the TST will always be negative.
6. P = Present
7. Less than 1 in 10 HIV+ persons will develop primary TB soon after inhaling the TB bacillus.



## Fact Sheet: Infectious TB Particles

### How is tuberculosis transmitted?

Tuberculosis is transmitted through infectious particles which are released into the air when a person with TB disease talks, coughs or sneezes. There was a great deal of doubt about exactly how TB was transmitted until two great scientists of 20<sup>th</sup> century performed a famous experiment in 1955<sup>1</sup>: Riley and Wells kept about 300 guinea pigs in sealed enclosures above a TB ward for two years. Air was allowed to exit from the TB ward only after passing through the guineapig enclosures. A control group of guinea pigs breathed air from the ward that had passed through intense ultraviolet light. Over the two year period, most of the guinea pigs who breathed the air from the ward were proven to have TB infection, while none of the control guinea pigs became infected. Recent experiments have shown that *Mycobacterium tuberculosis* can be grown from the air (as well as sputum) exhaled by coughing TB patients<sup>2</sup>.

**Figure 1.** Coughing generates millions of particles of different sizes.



### How are infectious particles generated?<sup>3</sup>

Coughing, sneezing or talking causes droplets of saliva or respiratory tract fluid to be released into the air. Large droplets (the ones we can see!) fall to the ground immediately, but smaller particles ranging from 100 $\mu\text{m}$  (one tenth of a millimeter) to 10 $\mu\text{m}$  in size are invisible. As fluid in these particles evaporate, only the central nuclei of the particles remain. These are called 'droplet nuclei' and are about 1-10 $\mu\text{m}$  in diameter. These small particles stay in the air for a long period time: because they weigh so little, they settle towards the ground very slowly; at a rate of around 12mm/minute.

### What happens when infectious particles are inhaled?

Humans breathe about 10m<sup>3</sup> of air per day; we are continually breathing droplet particles generated by ourselves and others! Large particles (>10 $\mu\text{m}$ ) don't make it very far in to our respiratory tract – they land in our throat and upper airways. Smaller particles (4-10 $\mu\text{m}$ ) are trapped by the mucous lining of our bronchi and bronchioles, and are coughed out. The smallest particles (2-4 $\mu\text{m}$ ) in size are deposited in our alveoli. Only about 6% of all droplet nuclei make it to the very smallest parts of our lungs.

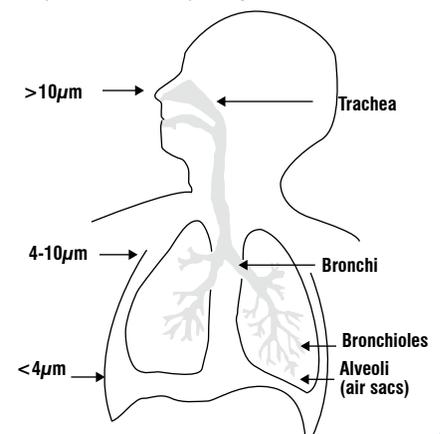
### Who is infectious and when are they infectious?

Not all people with pulmonary TB disease produce droplets and droplet nuclei which can settle in the alveoli. Some TB patients are more infectious than others. Treatment with TB drugs decreases the amount of TB bacilli that are released. Certain environments may be more likely to allow formation of droplet nuclei of the correct size to allow deposition in the alveoli. For example, when the air is dry, more droplet nuclei can form.

### How many TB germs must be inhaled in order for infection to occur?

Wells and Riley proved convincingly each 'TB granuloma' in a guinea pig represented infection with one TB bacillus<sup>4</sup>. In other words, if a TB bacillus reaches an alveolus, and is phagocytosed ('eaten or digested') by an alveolar macrophage, it can cause a granuloma and set up a chain of events leading to TB infection. If only 6% of droplet nuclei reach the alveoli, a person only has to inhale around 15-20 droplet nuclei in order to have at least 1 reach the alveolus. Droplet nuclei can contain 3-10 TB bacilli. Simply put; very few TB bacilli (less than 100) are required to cause TB infection.

**Figure 2.** Sizes of droplet nuclei and site of deposition in the respiratory tract.



#### References:

1. Riley R, Mills Cc, O'Gady F, Sultan Lu, Wittstadt F, Shivpuri DN. Infectiousness of air from a tuberculosis ward. Ultraviolet ir adiation of infected air: compa ative infectiousness of d fferent patients. Am Rev Respir Dis. 1962 Apr; 85: 511-25.
2. Fennelly KP, Marlyny JW, Fulton KE, Orme IM, Cave DM, He fets LB. Cough-generated aerosols of Mycobacterium tuberculosis: a new method to study infectiousness. Am J Respir Crit Care Med. 2004 Mar 1;169(5):604-9. Epub 2003 Dec 4.
3. See a fantastic summa y on the Belgian Biosafety server at <http://www.biosafety.be/CU/Bioaerosols/bioaerosols.html> (Accessed October 2008)
4. Mills CC, O'Gady F, Riley RL. Tuberculin conversion in the "natu ally infected" guinea pig. Bull Johns Hopkins Hosp. 1960 Jan;106:36-45



## Fact Sheet: Ultraviolet Germicidal Irradiation (UVGI)

### What is ultraviolet light and how does it kill bacteria?<sup>1</sup>

Ultraviolet (UV) light is like sunlight (in that it is electromagnetic irradiation) except that it has a different wave-length (usually 100-280nm). To our eyes, it looks blue, and if it has a shorter wavelength it is invisible. UV light is responsible for the 'tan' or browning of the skin that we experience with too much sunlight. UV light is effective at killing bacteria, including *M. tuberculosis* by damaging bacterial DNA and preventing bacterial replication. UV light can be produced by low-pressure mercury vapour lamps which are used in commercial ultraviolet germicidal irradiation (UVGI) fittings.

### What is the role of upper-air germicidal irradiation in TB infection control?

UVGI is a method of air cleaning **but it is not a substitute for other methods of air cleaning**, nor can it be used as the only method of TB infection control in a facility. It is best used as an additional protective method to reduce the infectivity of droplet nuclei. UVGI fittings are expensive; good TB infection control can be achieved in resource limited settings without UVGI. UV light kills bacteria when it shines on them for sufficient length of time and with enough intensity (brightness). UV light can damage human skin, and cornea, so UV fittings are designed to allow UV light to shine in the upper room only. UVGI therefore relies on mixing of air from lower to upper room. This means that air circulation must be present where UVGI fittings are installed. Air circulation can be achieved by opening windows and by use of fans. Some UVGI fittings have inbuilt fans to ensure air mixing.

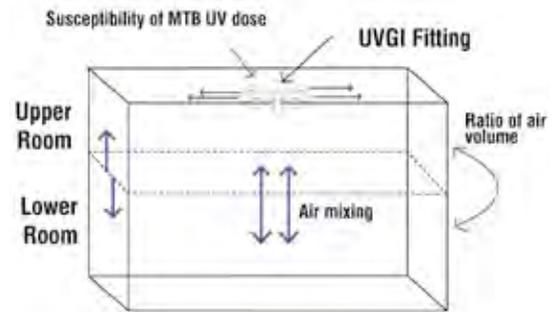
### Design of UVGI fittings

Upper-air UVGI fittings are suspended from the ceiling or installed on the walls. UV light is harmful, so shields (disc-shaped louvers) are placed on the fittings to ensure that no UV light is directed downwards.

### How many UVGI fittings does my facility need?

Current American guidelines<sup>2</sup> indicate that one 30W lamp, or two 15W lamps should be used for every 19m<sup>2</sup> of floor area. Where conditions are crowded, one UVGI fitting for every 7 room occupants should be used.

**Figure 1.** Factors affecting effectiveness of upper room ultraviolet germicidal irradiation in TB infection control



### Maintaining effectiveness of UVGI fittings:<sup>2</sup>

UV fittings attract dust. Dust reduces the amount of UV light released from the lamp. Therefore regular cleaning of UVGI fittings is necessary. Always be sure to switch off power from the fitting before cleaning. In addition, UV light output of lamps declines with age, so lamps should be replaced at appropriate intervals. Make sure the maintenance of these fittings is included as part of your facility's TB infection control plan. Monitoring of UV intensity and output of the fitting should be conducted. Request the assistance of your public works administrator.

### Safety considerations<sup>2</sup> when using UVGI fittings

Over-exposure to UV light can cause redness of the skin, (erythema), inflammation of the cornea (photokeratitis) and inflammation of the conjunctiva (conjunctivitis). Symptoms of these conditions include a feeling of sand in the eyes, tearing and sensitivity to light. These conditions are reversible. Typically they commence 6-12 hours after exposure. If staff complain of these symptoms, UV light is escaping into the lower part of the room. Either the lamp is poorly positioned, or the UV light is being reflected off shiny surfaces. Consider repositioning the lamp.

### Factors affecting the effectiveness of upper airway germicidal irradiation

The effectiveness of the UVGI fitting depends upon (see Figure 1):

**The rate of upper-room disinfection**, which depends upon

- The dose of UV light delivered to each bacterium
- How sensitive the bacteria are to UV light.

**The ratio upper room volume relative to the lower room volume**

- Air mixing between the upper and lower room.

Because of these factors, some recommendations can be made about how many fittings to install, and how to improve and maintain the effectiveness of the UVGI fitting. See the box above.

### Did you know?

**Air MIXING is essential if UVGI is to be effective**

#### References:

1. The technical reference sheets of <http://www.medicairisolutions.com/> provide excellent background.
2. Jensen PA, Lambert LA, Iademarco MF, Ridzon R; CDC. Guidelines for preventing the transmission of Mycobacterium tuberculosis in health-care settings, 2005. MMWR Recomm Rep. 2005 Dec 30;54(RR-17):1-141.



## Fact Sheet: N95 Respirator/Masks

### What is an N95 respirator/mask and how does it work to prevent transmission of TB?

Masks placed in front of and around the mouth and nose can act as filters, to capture infectious particles and prevent them from being inhaled. In this way, infection with TB can be prevented. Masks in this context can be called 'particulate filter respirators.' Droplet nuclei that have potential to transmit TB infection are 1-5µm in diameter. Masks that are able to prevent TB infection must capture particles this size and larger.

N95 respirator/masks meet specifications required by the United States National Institute for Occupational Safety and Health (NIOSH) which include:

- Filter size of 1µm in size
- Filter efficiency = 95%
- Tight facial seal.

The letter 'N' in N95 refers to the fact that the mask/filter is 'Not resistant to oil'.

### How well do the N95 respirator/masks prevent TB infection?

No-one has been able to measure this! Some guidelines don't even recommend the use of these masks! But one thing is for certain – they will NOT work if:

- They are not properly fitted
- If the wearer has facial hair (beard) preventing a proper fit
- They are damaged or crushed
- They are saturated (reused until the filter capacity has been exceeded)
- They get wet (even if they dry again).

### Can I re-use N95 respirator/masks?

N95 respirator/masks are expensive. It is helpful to re-use them. New masks can be issued after 2 weeks of use. General guidelines to facilitate reuse include:

- Each staff member should re-use their own mask (it is helpful to write the staff member's name on the mask)
- Keep the mask dry and clean.
- Replace masks if they are damaged, or get wet
- Never use the mask 'inside out' or reversed.

### Who should use ordinary surgical masks?

Surgical masks are very different from N95 respirator/masks. They have only 50% filter efficiency and lack a tight facial seal. **Infectious patients** should use ordinary surgical masks because these reduce the numbers of infectious particles in the air. Surgical masks are useful to catch larger respiratory droplets and prevent droplet nuclei from forming.

### Who should use N95 respirator/masks, and when?

HCW (and visitors) should use N95 respirator/masks in specific high-risk areas only<sup>1</sup>. These could include

- Areas where administrative and environmental controls probably will not protect persons from inhaling infectious airborne droplet nuclei. This would include the clinic rooms where TB suspects are seen, hospital casualty facilities, MDR TB treatment facilities.
- When dealing with patients with suspected or confirmed infectious TB (i.e. pulmonary TB, not TB meningitis)
- When cough-inducing procedures are performed on patients with suspected or confirmed TB disease;
- XDR or MDR treatment points or facilities.

Masks are NOT a substitute for administrative and environmental controls. Masks will improve personal protection when administrative and environmental controls are functioning optimally.

### Which TB patients are most infectious?

TB suspects with the following symptoms or conditions are more likely to be infectious:

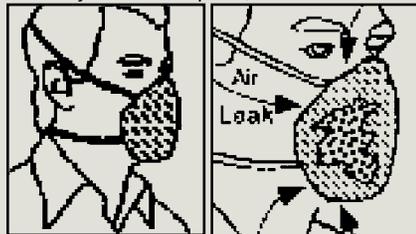
- Cough
- Cavitation on chest x-ray;
- Positive AFB sputum smear result;
- Respiratory tract disease with involvement of the lung or airways, including larynx;
- Failure to cover the mouth and nose when coughing;
- On TB treatment for less than 2 weeks.

### Fitting an N95 respirator/mask

A mask will provide no protection if it is not properly fitted, as air will flow through 'gaps' between the mask and the wearer's skin. Fit-tests should be done when selecting the type of mask that your facility uses as variability in facial structure can mean that different types of masks fit better. Any facial hair, such as beards or long sideburns, may prevent the respirator from fitting properly. An informal way to test the fit of your mask is as follows:

- Fit the mask according to manufacturer's instructions.
- Once the mask is in place, inhale sharply. The mask should be drawn in towards your face, indicating that a negative pressure has been generated.
- If the mask does not draw in towards your face, or you feel leakage at the edges, adjust straps by pulling back along the sides and/or reposition respirator.
- Repeat until mask is sealed properly.

Figure 1. (A). N95 respirator/mask (B) Air leaks on an incorrectly fitted N95 respirator/mask.



#### References:

1. CDC Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Settings, 2005. MMWR 225:54;1-55. RSA NDOH National TB Infection Control Guidelines. June 2007

## Fact Sheet: MDR and XDR-TB and Infection Control

### What is MDR and XDR-TB?

MDR-TB and XDR-TB are names given to strains of TB that have become resistant to TB treatment. Sensitive (ordinary) TB is treated with four drugs: isoniazid (INH), rifampicin (RIF), pyrazinamide (PYZ) and ethambutol (ETH).

#### MDR-TB:

- MDR stands for 'multi-drug resistant'
- Is resistant to rifampicin (RIF) and isoniazid (INH)
- These two drugs are the strongest TB drugs and resistance to them makes MDR-TB very difficult to treat.

#### XDR-TB

- XDR stands for 'eXtremely drug-resistant'
- Is resistant to rifampicin and isoniazid (ie it is already an MDR strain), and resistant to fluoroquinolones and one of the following injectable drugs: kanamycin, amikacin or capreomycin.

**Figure 1.** The newspapers make a really big fuss about MDR and XDR TB. Is it justified?



### How is MDR and XDR-TB diagnosed?

- By laboratory culture: MDR-TB and XDR-TB can only be diagnosed when the laboratory grows and does sensitivity tests on the TB germ. Smear microscopy will diagnose TB, but will not tell if that TB strain is sensitive or resistant to TB drugs.
- By clinical response: Patients who have MDR-TB will often respond initially to ordinary TB treatment, but will fail to improve and may deteriorate when continuation phase TB treatment is started.
- By new molecular tests: The HAIN's strip test (a PCR line probe assay) can be done on smear-positive sputum and can tell within 48 hours if the TB strain is sensitive to RIF and INH. Ask your laboratory if the HAIN's strip is available.

### How did MDR and XDR-TB develop?

Resistance to TB drugs occurs naturally in TB strains, but is very rare. When TB treatment is taken correctly (RIF, INH, PYZ, ETH for 2 months, then RIF, INH for 4 months) drug resistance will not develop. Until recently in South Africa, the TB control programme was poorly supervised. Drug resistance developed and spread. Today, a person can get drug resistant TB (MDR or XDR) in the following ways:

- Drug resistance in newly diagnosed TB patients usually occurs when a person is infected with a resistant strain of TB.
- Drug resistance in previously treated TB patients occurs when a person has been poorly adherent to TB treatment.

### How common is MDR and XDR-TB?

In 2002-3 a study of all TB cases in South Africa showed that MDR-TB occurred at a rate of 1.6% amongst new TB cases and a rate of 6.6% in retreatment cases. But this was a long time ago. Since then, XDR-TB was recognized for the first time in Tugela Ferry in KZN, when 53 XDR-TB cases were identified<sup>1</sup>. Reports suggest that there are over 300 cases of XDR-TB in South Africa, and around 8000 MDR cases.

### What infection control measures should be in place when MDR and XDR-TB cases are treated?

Identical TB infection control measures should be in place when MDR and XDR-TB cases are treated. Additional measures<sup>2</sup> should also be taken, including:

- Cohorting of resistant TB cases (i.e. keeping resistant cases together)
- Regular screening of all contacts of MDR and XDR-TB cases (including HCW) for TB disease. INH prophylaxis should be given (not second-line TB drugs) to children and adult HIV+ contacts.
- Strict wearing of N95 respirator/masks when in contact with infectious MDR and XDR patients.

### How are MDR and XDR-TB treated?

MDR-TB is treated with second-line TB drugs given as part of a standardised regimen of six-month daily intensive phase with five drugs (kanamycin, pyrazinamide, ofloxacin, ethionamide and either terizidone/cycloserine or ethambutol), followed by an 18-month daily continuation phase with three drugs (ofloxacin, ethionamide and either ethambutol or terizidone/ cycloserine). XDR-TB cannot be successfully treated as there are presently no effective TB drugs.

#### References:

1. Gandhi et al. Lancet. 2006 Nov 4;368(9547):1575-80. Extensively drug-resistant tuberculosis as a cause of death in patients co-infected with tuberculosis and HIV in a rural area of South Africa.
2. D aft. National Department of Health Guidelines for the Management of Drug Resistant Tuberculosis in South Africa. Nov 2007.

# 4

## Assessment of TB infection control in your facility



# Assessment of TB infection control in your facility

## Introduction

It is useful to assess the risk of TB transmission in your facility and to measure how well TB infection control measures have been implemented. After implementation of TB infection control measures, it is useful to measure how effective your changes have been. The assessment tool below can be used both before and after implementation of TB infection control measures for these purposes.

## Baseline assessment of TB infection control in your facility

Naturally, a way to find out the risk of TB infection in your facility would be to monitor all staff with tuberculin skin tests (TST) and other newer tests (the Quantiferon-Gold In-tube assay). But this would take several months, and in the mean time, TB transmission would occur. It would be rather unfair to one's staff. Rather, it is best to assess whether or not infection control practices are being implemented in your facility. This section provides a tool (on the next page) to assist with this .

### ACTION BOX:

**After receiving theoretical training in the principles of TB infection control, sit with a team at your facility including the facility manager and complete the TB Infection Control Assessment Tool (see next page).**

- Once completed, write the date of the assessment, sign and file it with your TB infection control record
- Then discuss the answers to the assessment tool
- Do not feel bad about finding areas where TB infection control in your facility is weak – if your infection control was 100%, there would be no need for this training course or material.

**Almost all health care facilities in South Africa can improve their TB infection control!**

## Assessment after implementation of TB infection control measures

TB infection control interventions require ongoing commitment by staff, and may also require some structural changes to the facility that will take time. It is important to have an ongoing review process to monitor the quality of TB infection control in your facility. The same tool (see next page) can be used to do this. Quality management of TB infection control is the responsibility of the Infection Prevention and Control Committee. Monitoring of TB infection control should be an item listed in the TB infection control plan, along with the name of the committee member who is responsible for reporting on it.

### ACTION BOX:

**Every month after implementing TB infection control measures, complete the TB infection control Assessment Tool (see next page).**

- It may be appropriate to have an external person complete the log intermittently
- Compare results with the previous months assessment, noting improvements and declines
- Report on the assessment at the Infection Prevention and Control Committee meetings. Discuss ways to ensure ongoing TB infection control
- Use the provided sheet '**Log for monitoring assessment of TB infection control**' (see next page) to record findings.

# TB Infection Control Assessment Tool

Facility name: \_\_\_\_\_

Date of assessment: \_\_\_\_\_ Completed by \_\_\_\_\_

## Instructions for completion:

- Circle the response most applicable to your institution. Total the scores in the place provided
- Retrieve last months assessment and complete the column 'Last months score' (LMS)
- Note improvements and declines in this month's assessment compared to last month's assessment.

## 1. Supporting structures and activities to ensure implementation of TB infection control interventions.

	0	1	2
1.1. Does your facility have an Infection Prevention and Control Committee?	No		Yes
1.2. Did this committee meet within the last 4 weeks?	No		Yes
1.3. Is there a TB Infection Control Plan for the facility?	No		Yes
1.4. Is the TB infection control plan displayed in a public place?	No		Yes
1.5. Were TB infection control measures assessed within the last 5 weeks?	No		Yes
1.6. Were staff trained in TB infection control this month?	No	Some staff	Yes
1.7. Were all newly diagnosed HIV+ clients screened for TB symptoms (cough, loss of weight, night sweat)?	Some (no proof)	Some (proof available)	Yes (proof available)
1.8. Were health talks given to waiting clients which included a message about TB symptoms and diagnosis?	No		Yes
1.9. Were any maintenance activities undertaken during the last 4 weeks on structures which improve TB infection control (e.g. air conditioning, fans, UVGI fittings)?	No		Yes
<b>Total score: (maximum = 18)</b>			

## 2. Administrative controls: Strategies to reduce generation of infectious aerosols:

	0	1	2
2.1. Are patients screened for cough as they enter your facility?	No	Occasionally	Yes
2.2. Are patients educated in cough hygiene as they enter your facility?	No	Occasionally	Yes
2.3. If patients cough, are they provided with masks/tissues to reduce infectious aerosols?	No	Occasionally	Yes
2.4. Are TB suspects/patients separated from those who are not?	No	Occasionally	Yes
2.5. Are TB suspects given priority to ensure shorter waiting times in outpatient facilities?	No	Occasionally	Yes
2.6. Were staff reminded of the need for 'early TB diagnosis' during this month?	No		Yes
2.7. Are there separate and ventilated facilities for sputum collection from suspects?	No	Yes, but not ventilated	Yes
2.8. Is there a 'fast-queue' for collection of sputum smear results?	No		Yes
2.9. What is the laboratory turn-around time for sputum AFB/microscopy for the last sputum AFB result received?	> 72 hours	48-72 hours	< 48 hours
<b>Total score: (maximum = 18)</b>			

## 3. Environmental controls: Strategies to remove infectious aerosols after generation:

	0	1	2
3.1. Are the windows in your facility able to open?	No	Some	Yes
3.2. Are the windows in your facility kept open during working hours?	No	Occasionally	Yes
3.3. Are fans used to increase circulation of air in your area of work?	No	Occasionally	Yes
3.4. Do you know the direction of airflow in each consultation room in your facility?	For none	Only for some	Yes
3.5. Do staff in consultation rooms sit with their back towards the direction of airflow?	Uncertain	Occasionally	Yes
3.6. Are ultraviolet germicidal irradiation facilities in use in high risk areas?	No		Yes
<b>Total score: (maximum = 12)</b>			

## 4. Personal risk reduction strategies to reduce inhalation of infectious aerosols\*:

	0	1	2
4.1. Were staff screened for TB infection symptoms this month?	No	Some staff	Yes
4.2. Were staff encouraged to know their HIV status this month?	No	Some staff	Yes
4.3. Were staff reminded of the risks of TB for people who are living with HIV this month?	No	Some staff	Yes
4.4. Were staff trained to recognize and diagnose TB this month?	No	Some staff	Yes
4.5. Are N95 respirator/masks available this month?	No	Sometimes	Yes
4.6. Were N95 respirator/masks used by staff in high risk services this month (e.g. TB, coughing queue)?	No	Sometimes	Yes
<b>Total score: (maximum = 12)</b>			

\*for this section, complete by asking one staff member at random. If some staff were asked or trained but the requested staff member was not, complete the response as 'some staff'.

# Log for Monitoring Quality of TB Infection Control

(make copies as required)

Date of assessment	Name of assessor	Score	Comparison with previous assessment (Improvement or decline)	Comment (indicate reason for improvement or decline and intervention required)
		Supporting structures (/18)		
		Administrative controls (/18)		
		Environmental controls (/12)		
		Personal protection (/12)		
		Supporting structures (/18)		
		Administrative controls (/18)		
		Environmental controls (/12)		
		Personal protection (/12)		
		Supporting structures (/18)		
		Administrative controls (/18)		
		Environmental controls (/12)		
		Personal protection (/12)		

## Notes

# 5

## Step by Step Implementation of TB Infection Control Measures



# Implementation of infection control measures

Section 5 provides a step-by-step approach to implementation of infection control measures, including the formation of an Infection Prevention and Control Committee, and Infection Control Plan, and implementation of administrative, environmental and personal risk reduction to prevent transmission of TB. If your institution already has some TB infection control measures in place, you may find it appropriate to skip certain steps. However, be sure that your plan covers all the necessary requirements.

## Preliminary measures: Ensuring managerial support for TB infection control

- It is not possible to implement TB infection control measures without the support of your facility line managers or public health officials. Before arranging the training course in Step 1 discuss the need for TB infection control with your managers. Show him/her the results of your baseline assessment. Leave a copy of this manual with him/her. In this way, you will ensure your success.

## Step 1: Arrange an on-site training session in TB infection control

- Arrange an on-site training session in TB infection control by appropriately skilled persons or organizations.
- Ensure that all persons required for an Infection Prevention and Control Committee are present at the training:
  - If your facility is a primary health care clinic, the facility manager, all professional nurses including the TB control programme nurse or nursing assistant, a person responsible for general cleaning and maintenance, reception area staff (clerks, security) and if possible, the municipal public works officer who has responsibility for the facility should be present at the training. (For members at tertiary hospital level, refer to NDOH TB Infection control guidelines).
- Set aside three hours for the training, and ensure that it is done at your facility (ie on site).
- Ensure that you have the following material present so that a baseline assessment can be done, and the most basic infection control measures can be implemented immediately. (Arrange this with your trainer):
  - Incense sticks
  - Coloured pencils
  - Tissues/handkerchiefs for patients, or ordinary surgical masks
  - N95 respirator/masks for staff
  - Client and HCW promotional material for TB infection control.

## Step 2: At the training session, review the facts of TB infection control

- Ensure that everyone present understands the need for TB infection control, and that the proposed interventions have value in reducing risk of TB amongst HCW
- If using these materials, this would entail going through Sections 1, 2, and 3 (Fact sheets).

## Step 3: Establish the Infection Prevention and Control Committee

- If an infection control committee already exists, or if infection control matters are dealt with by an existing committee, it may not be necessary to form a new committee. In this case, ensure that members of the existing committee attend this training session.
- As a group, decide who will sit on this committee, who will chair it, how often it will meet, and how records (agenda and minutes) will be taken, circulated and stored
- Document these facts in the Infection Control Plan template
- This training session will become the first meeting of the Infection Prevention and Control Committee. Ensure that someone is assigned to take minutes.

From this section onwards, all decisions made regarding TB infection control will form part of the 'TB infection control plan'. Use the template 'infection control plan' to record these decisions.

### Step 4: Establish baseline patterns of client movement and airflow through your facility

- In the box below, sketch a plan of the facility including areas where clients are present. Label the reception and administrative areas, waiting areas, consultation rooms, pharmacy and any other areas where clients are present
- On the sketch, use coloured pencil, and arrows to indicate movements of clients. If certain clients have different movements use different coloured pencils. Eg, use red pencil to trace the path of TB clients, green to trace family planning clients etc. Do not use blue pencil.
- Assess circulation and dilution of air in different areas of the facility as follows:
  - Light an incense stick, and extinguish the flame as soon as it burns. The stick should be smoking
  - While normal activities are happening in the facility (ie. during working hours, and with windows as they normally are (ie. closed or open), take the incense stick to every area of the facility.
  - In each area, on your plan of the facility, make a note of:
    - the direction of smoke (using a blue arrow)
    - rapidity with which smoke is dispersed. If smoke does not move, write an 'O' in that area. If smoke does move, use +/+ +/+ +/+ +/+ +/+ + to mark how quickly the smoke is swept around the room. This is particularly important in the waiting areas, and in the consultation rooms.
  - Refer to the example provided below to assist you.

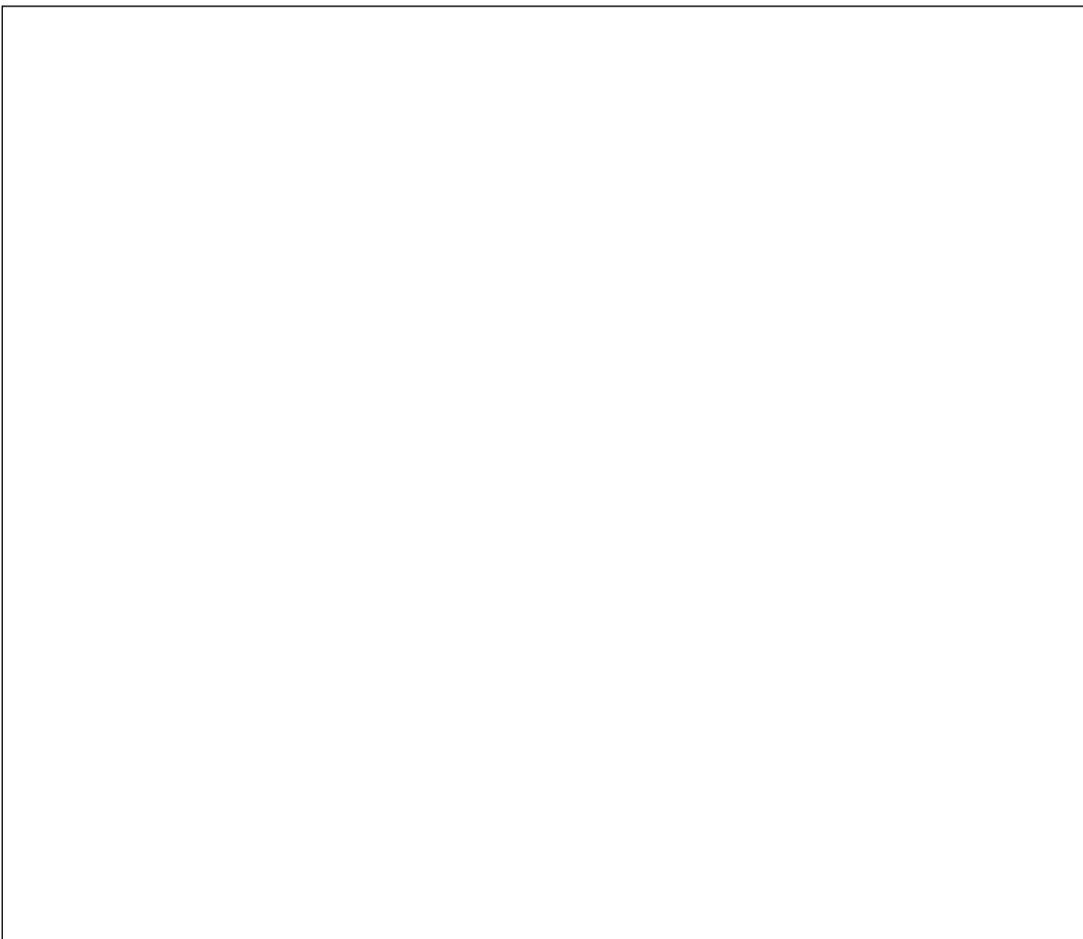
#### Sketch of your facility with existing air and client flow patterns

Example	Your facility

## Step 5: Select special waiting areas for coughing patients

- Consider how your clinic could adapt to have a separate waiting area for clients who cough
- Bear in mind that clients who cough may be TB suspects or they may be clients presenting for other clinic services (e.g STI treatment, family planning). Not all patients with TB are infectious, as some have been on TB treatment for a while.
- Refer to your sketch above to see how your proposals could take advantage of existing ventilation and air flow.
- DISCUSS options with the facility staff. Take client flow and queuing systems into account. Consider the following possibilities:
  - Set up a waiting area outside the clinic (in an open area) for clients who cough. Arrange seating (benches) and cover from rain/sun. (This may require funds and involvement of public works department, and may take time to set up. Use this opportunity to initiate this.) Use a paper number system to place clients in queues for various services, so that clients are called for by number when it is their turn for consultation. Try always to see clients who cough first
  - Define a waiting area within the facility (indoors) for clients who cough. Assign consultation room(s) and one or more professional staff to run the 'coughing queue'. Ensure that all services required by clients can be offered from this consultation room and by the professional staff assigned to this room. TB services should be included in this area. It may be necessary to make exceptions; for example, clients who are coughing but need ante-natal services should still wait in the ante-natal clinic queue. However, they should be seen first, to minimize waiting times.
- Agree on the best system. Again draw a sketch of your facility in the box below, and label your sketch according to your decision. Again, use coloured pencils, and arrows to indicate movements of different kinds of clients from reception, to your newly defined waiting areas, and consultation rooms.

### Sketch of your facility with NEW client flow patterns



## Step 6: TB infection control at the reception area of your facility

- Select posters from this manual (see Section 6) to display in the reception area of your facility
- Identify which reception staff will screen clients for cough. You may like to role-play how it is to be done. A discreet and gentle manner is appropriate.
- Decide how screening for cough should be done. The following questions could be asked:
  - Are you coughing?
  - Have you been coughing for more than two weeks?
  - Are you being investigated for TB?
  - Are you receiving TB treatment?
- An affirmative answer to any questions means that the client should be educated in cough hygiene and provided with tissues or a face mask. If this is not possible (tissues or masks are not available), clients should cough into their upper sleeves or elbows, but not into their hands. Clients should wash hands after coughing
- The HCW who identifies coughing clients should provide them with tissues or a face mask, and request them to cover their mouth and nose when they cough. This is 'cough hygiene'
- Request clients to dispose of masks and tissues in clearly marked bins in waiting areas and consultation rooms
- Direct coughing clients to separate waiting areas, if an area has been allocated by the Infection Prevention and Control Committee. The waiting system for coughing clients should be explained to clients who cough, and they should follow through with instructions given. The queuing system should be explained to all clients regardless of coughing status, to reassure clients that the system is fair, and that pushing coughing clients to the front is a measure for everyone's protection.

## Step 7: Management of clients in waiting areas

- Display TB infection control posters in the waiting areas for coughing and non-coughing clients
- Allocate staff to give health talks and health education (including pamphlets) regarding the importance of TB infection control, including cough hygiene and TB symptoms
- Place waste disposal containers in waiting areas
- In non-coughing queues, health care workers should periodically identify and attend to coughing clients before other clients in order to minimize waiting times.

## Step 8: Interventions to improve airflow through the facility

- Refer back to air flow diagram. Decide on areas where airflow is poor and discuss interventions to improve airflow in these areas of the clinic
- Allocate the task of opening of doors and windows to specific staff member(s)
- Decide where the use of fans to dilute air and disperse infectious particles is appropriate
- In each consultation room, establish the direction of air flow, and identify the most appropriate place for the client and HCW to sit. Label the direction of airflow in the room by placing a sign on the wall. Refer to the 'Ventilation and TB infection control' Fact sheet
- Once changes have been implemented, check again with incense to review the effect of the changes on air flow and dispersion of air.

## Step 9: Interventions to kill airborne mycobacteria

- Consider placing ultraviolet gamma irradiation (UVGI) lamps in areas where infectious aerosols are most likely to be concentrated in your facility – e.g. cough waiting area, TB queue, reception. Refer to the ('Ultraviolet germicidal irradiation' Fact sheet) to understand how and where to place these
- Liaise with public works regarding funding and installation of these lamps
- If UVGI lamps are already installed, establish what the maintenance and cleaning requirements of the fittings are. Allocate the task of maintenance of these lamps to specific staff members.

## Step 10: Personal protective equipment

- Identify areas of the clinic in which staff should wear N95 respirator/masks. These areas would include consultation rooms where coughing patients are seen and where administrative and environmental controls are insufficient to reduce infectious droplet nuclei significantly
- Place signs in these areas to remind staff to wear the masks. (see Section 6).
- Write up a policy on the use of N95 masks. Include the following:
  - Name the areas where N95 mask should be worn
  - Indicate who should wear N95 masks (categories of staff and visitors)
  - Discuss allocation of masks, frequency and criteria for mask replacement, mask storage and ordering responsibilities.
- Include this policy in the INFECTION CONTROL PLAN
  - A template “N95 mask-use Policy” is found after the TB Infection Control Plan in this manual.

## Step 11: Personal risk assessment

- Allocate to a senior staff member the task of asking all staff members these three questions every month:
  - Are you coughing for more than two weeks, sweating at night or losing weight?
  - Do you know your HIV status?
  - Do you know that if a person is HIV-positive, INH prophylaxis can reduce the chances of developing TB disease?
  - Use the attached log to monitor the responses to these questions.
- Maintain a list of appropriate referral sites for staff who request or require further investigation in response to any of these questions.

## Step 12: Facilitate early diagnosis of TB

- Display diagnostic algorithms for pulmonary TB in appropriate consultation rooms (see the RHRU ‘Integrated TB/HIV Services Manual’)
- Allocate a staff member the responsibility of training staff in diagnostic algorithms for TB. This may require the help of outside sources.

## Step 13: Ensure ongoing quality of TB infection control practices

- Allocate to a specific staff member the task of monthly quality assessment of TB infection control interventions using the TB infection control assessment tool.

## Step 14: Review of minutes and setting of important dates

- Review the minutes of this meeting, and clarify who will circulate them to all attendees.
- Clarify which tasks have been allocated to which individuals, including:
  - liaising with public works regarding outside seating, UVGI, purchase or maintenance of fans and maintenance of air conditioning units
  - Completion of the infection control plan, and posting of this in specific public places
- Establish a date within the next two weeks for sharing the infection control plan with the entire staff of the facility
- If major changes to services are required, plan to change services on a specific date
- Set a date for the next month on which the newly formed TB Infection Prevention and Control Committee will meet.



**Floor plan of facility showing client movements and air flow directions**

**TB infection control at facility reception area**

\_\_\_\_\_ (name) will be responsible for TB infection control here.

The following TB infection control practices will be implemented at reception into our facility:

• Posters about TB infection control will be displayed	• Clients who cough will be given tissues or a mask
• The queueing system will be explained to all clients	• Clients who cough will be asked to dispose of tissues or mask using bins provided
• All clients will be asked if they are coughing	• Clients who cough will be directed to a special waiting area
• Clients who cough will be asked to cough into tissues or a mask	

**TB infection control at facility waiting areas and adjacent consultation rooms**

Area description	Name of person responsible

The following TB infection control practices will be done at waiting areas in our facility:

• Posters about TB infection control will be displayed	• Tissues and masks will be displayed in a prominent position in the waiting area
• The professional nurse (or nurse staffing the service) will periodically scan the queue for coughing clients.	• Bins or appropriate receptacles for disposal of tissues/masks will be placed in a prominent position in the waiting area.
• Coughing clients will be seen first	• Windows or doors will be opened to ensure maximum air flow.
• Direction of air flow in each consultation room will be established and marked with a sign. HCW should sit with the clean air moving from behind them towards the client	• Appropriate arrangement of professional nurse/doctor and patient in consultation room will be maintained according to airflow direction
• N95 respirator/masks will be available in consultation rooms for HCW	• Fans will be located in appropriate areas (consultation rooms and/or waiting areas) and be operational

**TB infection control equipment maintenance log** (make copies as required)

\_\_\_\_\_ (name) will be responsible for maintenance of TB infection control equipment.

The following TB infection control equipment are used at our facility: (this should include fans, UVGI fittings, air conditioning units situated in the facility):

Name of equipment:	Situation in facility	Name of maintenance company	Contact details of maintenance company

**Equipment maintenance and cleaning log:**

Name of equipment \_\_\_\_\_

Description of maintenance required: \_\_\_\_\_

Date	Type of service done:	Next service required on:	Date	Type of service done:	Next service required on:

Name of equipment \_\_\_\_\_

Description of maintenance required: \_\_\_\_\_

Date	Type of service done:	Next service required on:	Date	Type of service done:	Next service required on:

Name of equipment \_\_\_\_\_

Description of maintenance required: \_\_\_\_\_

Date	Type of service done:	Next service required on:	Date	Type of service done:	Next service required on:

**N95 mask use policy** (make copies as required)

**In this facility, people working in the following areas are advised to wear N95 masks:**

**In these areas, the following person will be responsible for displaying posters indicating the need to wear N95 masks:**

**Persons unwilling to wear N95 masks in these areas should indicate this in the following way:**

**In this facility, masks will be replaced in the following circumstances:**

**All persons having masks will handle them in the following way:**

- Assessment of individual quality of mask fit:
  
- Labelling of mask
  
- Storage when not in use.

The following person will be responsible for ensuring that all staff (existing and new staff) will receive training in use of N95 masks, including review of this policy:

The following person will be responsible for re-ordering of masks:

The following person will be responsible for displaying the most up-to-date N95 mask use policy in appropriate areas of the facility:

**TB infection control staff training log** (make copies as required)

Names of staff attended										
Name and contact details of trainer										
Name and description of training										
Date										



## Notes

# 6

## Resources for TB Infection Control



## Resources for TB infection control

This section contains visual material for display in Health Care Facilities. The intention of this material is to raise awareness of the need for TB infection control amongst clients and staff, and to encourage adherence to TB infection control measures. Some material or posters can be photocopied from this manual; other material is available in poster format from RHRU, and is reproduced here for completeness. A summary of material follows below:

### Material promoting infection control amongst facility clients

Poster informing clients that the facility is implementing TB infection control policies and that if they cough, waiting times maybe shorter.

- Display this poster in the facility reception area and in client waiting areas

Poster: What did you do to prevent TB today?

- Display this poster in facility reception areas and in client waiting areas

Poster encouraging early diagnosis of TB

- Display this poster in client waiting areas

### Material promoting infection control amongst HCW

Poster: Use N95 respirator/mask in this consultation room

- Display this poster in consultation rooms where N95 respirator/masks should be worn

Poster: Airflow direction in this consultation room is

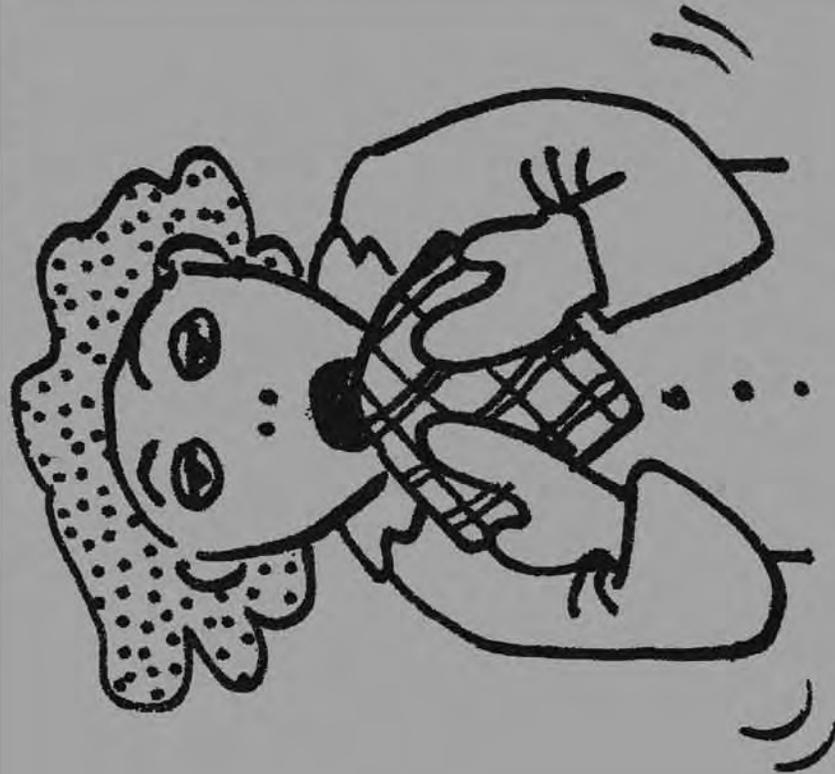
- Photocopy this poster and display it in all consultation rooms; the direction of airflow in the room should be indicated on the poster with an arrow (using a thick black marker). The airflow direction should be determined using incense sticks.

Poster summarizing infection control measures

- Display this poster in staff tea rooms, consultation rooms and areas frequented mainly by staff

TB infection control is practiced in this facility

# TB Infection Control is practised in this Health Care Facility



**If you are coughing,  
tell us:**

- You may be seen faster!
- Ask for tissues or a mask!
- Cough into tissues, mask  
or your elbow to prevent  
spread of germs!



What did you do to prevent TB today?

# What did YOU do to PREVENT TB today?

## You can help prevent TB by:

### 1 Coughing responsibly

This will help to stop the spread of TB and other germs to people

- Cover your mouth and nose with a tissue when you cough
- Cough into your elbow NOT into your hand
- Wash hands after coughing



### 2 Opening windows

This will help to keep the air around you clean

- Open the windows at home
- Open the windows in the taxi
- Create a draft – this will blow TB germs away



### 3 Going to the clinic if you are coughing, sweating and losing weight

This will help the clinic sisters to treat you for TB before you spread TB germs to people



### 4 Taking pills to prevent TB

This will help to protect you from getting sick with TB

- If you are healthy, and living with HIV, you can take pills (INH) to prevent TB disease



**Know your HIV status** TB makes HIV worse  
HIV makes TB worse



Supported by UNDP through RHRU

Encourage early diagnosis of TB

# Diagnosis of TB

How do health care workers diagnose TB in adults?

TB OF THE LUNGS

**TB of the lungs makes a person feel like this:**

Cough for more than 2 weeks



Night sweats and fever



Loss of appetite and weight



A person who feels like this should visit a clinic

The nurse will ask for 2 sputum samples and may take a chest x-ray

**A person has TB if:**

The laboratory sees the TB germs in the sputum



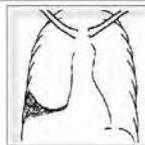
OR

The laboratory grows the TB germ from the sputum



OR

The chest x-ray shows lung damage from TB



Then the clinic will start TB treatment

OTHER TB

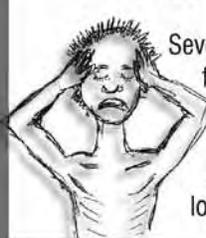
**When TB is not in the lungs, a person may feel like this:**

**TB of the lymph nodes**



Swollen glands, sweating at night, loss of weight

**TB meningitis**



Severe headache for more than 2 weeks; fever, night sweats and loss of weight

Then the clinic will arrange TB tests at hospital

**Know your HIV status**

TB makes HIV worse  
HIV makes TB worse



Wear your N95 respirator/mask

# Wear your N95 MASK RESPIRATOR

**Transmission of TUBERCULOSIS may occur in this area**



**Protect yourself from TB**

USAID USAID  
joburg  
JDA  
RHRU  
RHRU

Designed by Manik Design 011 482 3049

Airflow direction in this area

**AIRFLOW DIRECTION**  
in this area is indicated by the arrow

Healthcare workers: Sit with clear air blowing from behind your shoulders

Your Facility TB infection control officer should establish direction of airflow under normal conditions using incense sticks.

Designed by think design 2011 - JIC 2010

USAID jobs J.D.A. RHRU

Tuberculosis transmission

# Health care workers: What can you do to reduce Tuberculosis transmission?

Let's help each other prevent TB!

Health care workers are at great risk for developing TB disease. But these simple measures can reduce our risk:

## Support measures

These facilitate implementation of TB infection control



The **Infection Prevention and Control Committee** co-ordinates TB infection prevention

The **TB infection control plan** describes who does what in this facility to prevent spread of TB

**Client awareness of TB is raised by** posters encouraging cough hygiene and cough disclosure. Health talks include a message on TB diagnosis and prevention

**Staff training** in TB infection control and early diagnosis of TB

**TB/HIV collaboration means that** HIV+ patients are screened for TB. INH prophylaxis prevents TB disease.

## Administrative controls

These reduce the production of infectious TB particles in this health care facility

- Screening clients for cough as they enter this facility
- Educate clients in cough hygiene
- Give masks/issues to coughing clients as they enter this facility
- Separate clients who cough from those who don't
- Reduce waiting times for clients who cough
- Investigate clients who are coughing for TB
- Provide a safe environment for collection of sputum.



## Environmental controls

These eliminate infectious TB particles from this health care facility

- Ventilate client waiting areas by opening windows
- Maintain good air circulation with open windows and fans in waiting areas and consultation rooms
- Use ultraviolet germicidal irradiation (UVGI)
- Service air conditioning and UVGI lamps regularly.



## Personal risk reduction

These reduce inhalation of infectious TB particles by staff and clients and reduce risk of TB disease

- Use N95 masks to prevent inhalation of TB
- Encourage clients and staff to know their HIV status
- Screen staff for TB symptoms
- Provide INH prophylaxis for HIV+ clients and staff



## Ongoing quality assessment

Regular assessment of quality of TB infection control practices ensures that the environment is as safe as possible to prevent TB amongst clients and health care workers.



**Know your HIV status**  
TB makes HIV worse  
HIV makes TB worse



## Notes



# RHRU

Reproductive Health & HIV Research Unit  
of the University of the Witwatersrand, South Africa

**Postal address:**

Reproductive Health and HIV Research Unit  
PO Box 18512  
HILLBROW  
2038

[www.rhru.co.za](http://www.rhru.co.za)

Tel: 011 358 5500

Fax: 011 358 5400

**Physical address:**

Reproductive Health and HIV Research Unit  
Hugh Solomon Building  
Hillbrow Health Precinct  
Cnr Klein and Esselen Street  
(Opposite 17 Esselen Street Clinic)  
HILLBROW  
2001

