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HATiP

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HIV and TB in Practice for nurses: TB infection control

By Lesley Odendal

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Why is TB infection control an important issue for nurses?

Tuberculosis (TB) is a disease which is spread from person to person through the air. In places where people are congregated together or crowded, such as clinics, factories, public transport, religious settings, bars and some houses, it is important to prevent the spread of TB from person to person. This is especially important in clinics where people who may have TB are crowded next to people who may not be infected with TB. People with HIV are especially susceptible to TB disease making it critical that TB infection control measures are implemented in health facilities where people living with HIV (PLHIV) receive care.

Nurses have many important roles to play in TB infection control, both to protect patients and to protect themselves and their colleagues. This edition of HATIP for nurses explains the key recommendations and facts regarding TB infection control in the health facility.

How is TB spread?

TB is spread when a person with active TB disease talks, coughs, sneezes or sings. The TB bacteria are released into the air through droplets of saliva or respiratory fluid. The large droplets can be seen and fall to the ground, because they are heavier. However, the smaller particles, which ranging from 100µm to 10µm in size, are invisible and light so they stay in the air for a long time, making it easy for people to inhale them and become infected with TB.

Infection control

Infection control for TB falls under the World Health Organization's recommended approach of preventing TB in PLHIV called the *Three I's for HIV/TB*, including Intensified TB case finding and Isoniazid preventive therapy (IPT).

Healthcare workers, such as nurses, are especially vulnerable to TB, because they are more exposed to TB in their working environments. The prevalence of latent TB infection (infection with TB bacteria without evidence of active TB disease) among healthcare workers averages 54% (ranging from 33% to 79%) in low- and middle-income countries, according to a review conducted in 2006.[1]

New latent TB infection was documented to occur at a rate of 19.3 per 100 person-years (95% CI 14.2-26) in 159 Zimbabwean nursing students. In other words, one in five students became infected with TB for every year they studied and practised nursing. This rate of TB infection was six times higher than the rate in non-healthcare students observed for the same time period.[2] TB infection control is not only to protect patients, but also to protect healthcare workers from TB.[2]

Infection control is not only the responsibility of the healthcare workers working in the TB or HIV sections of the health facility. People who come to the clinic for any other reason, such as immunising their infants or for other illnesses of their own, may have undiagnosed active TB and they could spread the disease to other patients and healthcare workers.

Undiagnosed TB in parts of the health facility that do not deal with TB can pose a greater risk of transmission than diagnosed and treated TB in the TB sections where patients are receiving treatment. Once a patient with susceptible TB is on treatment with anti-TB drugs for about two weeks, s/he is much less infectious, while those who have undiagnosed TB can infect others more. However, it is still essential that TB infection control activities are also implemented where patients receive TB treatment. Besides parts of the health facility where people congregate while waiting for clinical consultation, other waiting areas such as for laboratory services or drug dispensing might be very high-risk spots for transmission of TB.

Infection control is the responsibility of every person working in a health facility and requires teamwork. TB infection control measures are based on three sets of controls, which should be implemented in all parts of a health facility or congregate setting:

1. Administrative controls: reducing the production of TB into the local environment.
2. Environmental controls: removing TB once it has been generated.
3. Personal controls: decrease or prevent inhalation of TB by health staff and patients.

These three levels of controls are equally important and need to be implemented together to ensure the best possible TB infection control in health facilities and other congregate settings.

Creating an enabling environment for TB infection control

Creating an enabling environment for infection control in health facilities is very important, as this will ensure that the administrative, environmental and personal controls can be implemented. The following should be implemented to create an enabling environment for infection control.

Managerial support for TB infection control

To ensure that TB infection control measures are successful, commitment from health managers is necessary. This includes the district and provincial managers. The facility manager and the managers of different sections of the facility should be made aware of the risks of TB transmission to themselves, their staff and their patients, and how it can be prevented. If the managerial team is not committed to implementing TB infection control measures, it will be difficult for the rest of the staff to stay motivated. If you feel your managers are not providing support for implementing TB infection control, it may be because they are not aware of the risks of TB transmission or what needs to be done to prevent it. You can use this bulletin, which is based on WHO recommendations, to provide your managers with the necessary information on TB infection control.

The TB Infection Control Committee

A TB Infection Control Committee should be formed to co-ordinate activities amongst the different sections of the facility. This committee is a multidisciplinary group which should consist of the facility manager, professional nurses from each clinic section,

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including the TB control programme nurse or nursing assistant, a person responsible for general cleaning and maintenance and reception area staff such as clerks. If your health facility already has a general infection control committee, this team can also be responsible for TB infection control and you may not need to set up a new one for TB.

The responsibilities of the Infection Control Committee are:

- To meet regularly (at least quarterly, but monthly if possible) to produce and update a TB infection control plan.
- To review the quality of TB infection control in the facility and to suggest changes where needed to ensure infection control is implemented.
- To ensure ongoing staff training (for all staff) in TB infection control.
- To ensure that there is a budget for infection control activities.
- To ensure provision of safety materials such as personal protective equipment.
- To organise training of healthcare workers on current infection control guidance.

The TB infection control plan

Each health facility should have a TB infection control plan which outlines the strategy used to implement TB infection control activities. The plan should detail every step that needs to be taken in the facility to ensure that the administrative, environmental and personal controls (discussed below) will be implemented. The plan will also name the person responsible for each intervention. The TB infection control plan should be updated as the committee identifies necessary changes to ensure better infection control or when there are changes in staff members.

Staff training

All facility staff and volunteers, including those who do not provide TB care directly, such as nurses, doctors, administrators, cleaners, data clerks, security guards and laboratory and pharmacy personnel, should be trained on the risks of TB transmission. This should be done at least every six months and for all new staff in the facility. Each staff member should be made aware of the details of the infection control plan and be encouraged to monitor its implementation. As every person is responsible for TB infection control, knowing the strategy of the infection control plan will ensure that all staff hold each other accountable for the successful implementation of the plan.

All staff and volunteers working at health facilities should be educated on the symptoms of TB to ensure that they get tested for TB and treated where necessary. Quick reference materials in a form such as brochures, posters, pamphlets, or job aids can also assist dissemination of the facility's TB infection control plan.

Education of community in TB and infection control

It is equally important that the wider community and catchment area of your facility are aware of the symptoms of TB and how to prevent its spread. When people are aware of TB symptoms, it leads to better health-seeking behaviour and potentially a shorter time for the person to be diagnosed and started on treatment. This reduces the spread of TB in the community.

Communities should also be educated on how they can improve TB infection control in their homes, workplaces, religious settings and on public transport, by improving natural ventilation (see environmental controls). People should also be educated about cough etiquette (see personal controls).

Peer educators can be used to hold talks about TB symptoms and infection control in public places and at public events. Health promotion talks should also be held in facility waiting areas and posters and pamphlets about TB symptoms and infection control should be made available to clients.

Administrative controls in healthcare facilities

Administrative controls reduce the production of TB particles in health facilities. The following administrative controls should be implemented in all health facilities, including in sections that do not specifically address TB.

Screening of clients for cough as they enter the facility

In order to reduce the production of TB particles into the environment, clients who are coughing need to be identified as early as possible. Clients can be asked for a history of coughing, or can be observed. The sooner coughing clients are identified, the fewer TB particles will be released into the facility.

The best place to identify coughing clients is in the client reception or waiting area. A staff member, such as the reception clerk or triage person, should be assigned responsibility for this task. Clients should be asked in a gentle manner if they cough and a poster promoting client disclosure of coughing should be placed in the reception area.

Coughing patients can be given priority to receive faster medical consultation or investigations in order to reduce their time in the waiting areas. If not possible, a separate, well-ventilated or open area should be made available for coughing clients. They should be instructed on cough hygiene (see below).

TB is a highly stigmatised disease and this should be kept in mind when identifying coughing patients. Client confidentiality should be maintained.

Education of clients in cough hygiene

When you cough into the air or into your hand, germs (including TB) are likely to spread. If someone is coughing, it is better if they cough into a piece of cloth, a tissue or a paper mask to trap the TB droplet. Tissues and paper masks should be made available in the waiting room. These should be disposed of once used in a dustbin. If such physical barriers are not available, the mouth and nose should be covered during cough with the bend of the elbow or hands, which must then be cleaned immediately. Such cough hygiene also applies to health workers, visitors and families. All clients should be educated on proper cough hygiene in the health facility, in public and at home.

Triaging of coughing patients

Triaging involves the separating and fast-tracking of people who are coughing and may have pulmonary TB. All patients should be screened routinely upon arrival for coughs lasting longer than two weeks, fever, weight loss and night sweats. People suspected of having pulmonary TB should be "fast-tracked" for rapid diagnosis and any health services which they need. This means that the coughing person leaves the clinic earlier and fewer TB or other germs will be released into the air.

If the main reason for the person visiting the healthcare facility is not because of their cough (such as infant immunisation, family planning etc.), they should receive these first without waiting and then be investigated for cough.

Healthcare workers should explain to patients that the fast-tracking system is for the safety for all people and that the goal

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is to reduce the chances of the transmission of TB and other diseases. Posters in the waiting area should encourage patients to let staff know if they are coughing and indicate that waiting times will be shorter. This will decrease frustration when coughing clients appear to 'jump' the queue.

Safe sputum collection

Sputum collection can be very risky in terms of TB transmission and should be done in a safe environment. The safest environment is outdoors, as this provides the best ventilation and natural sunlight. The client should have access to a private space to cough sputum, and to running water for washing their hands afterwards. Sputum booths can provide privacy but should be well ventilated.

HIV and TB prevention and care

Provide a package of prevention and care interventions for health workers including HIV prevention; antiretroviral therapy and isoniazid preventive therapy for health workers living with HIV.

All health workers should be given appropriate information and encouraged to undergo TB diagnostic investigation if they have signs and symptoms suggestive of TB. Similarly, all health workers should be given appropriate information and encouraged to undergo HIV testing and counselling. If diagnosed with HIV, they should be offered a package of prevention, treatment and care that includes regular screening for active TB and access to antiretroviral therapy. Based on the evaluation, health workers should be put on either isoniazid preventive therapy (IPT) or a full regimen of anti-TB treatment, should they be diagnosed with active TB. Health workers with HIV should not be working with patients with known or suspected TB (in particular, they should not be working with patients with multidrug-resistant TB and extensively drug-resistant TB), and they should be relocated from positions where risk of exposure to untreated TB is high to a lower risk area.

Environmental controls

Environmental controls remove TB particles from the air once they have been released. Environmental controls are important in healthcare facilities but should also be implemented in congregate and other settings such as homes, factories, prisons, public transport, religious settings and bars. Individuals should be educated on the importance of environmental controls in these settings and encouraged to implement these.

Ventilation

Health facility waiting areas and consultation rooms should be well ventilated. Ventilation means that there is a place where fresh air can enter the building and stale, infected air can leave the building. This removes infectious particles, and dilutes those that remain. This decreases the chances of people inhaling infectious particles. Ventilation can also control the direction of air flow, so that air flows from less contaminated to more contaminated areas.

Waiting areas for all clients should be chosen on the basis of the degree of ventilation available in that area. This may mean shuffling areas in your health facility to ensure that the TB and HIV sections have the best ventilation and that there is good ventilation in waiting areas.

Natural ventilation is always better than mechanical ventilation as mechanical ventilation is expensive, requires a constant power supply and may break down, which often takes a long time to repair due to budget constraints. Mechanical ventilation systems should only be considered in well-established settings which have a constant electricity supply, where trained maintenance staff are guaranteed and where there is access to parts in case of repairs.

In cases where mechanical ventilation is used, a staff member should be assigned to check daily that the ventilation equipment is working.

In warmer climates, where possible, ensure that all windows and doors are open in the health facility to allow good ventilation. Placing posters which explain why it is important to keep windows and doors open may be necessary to ensure that patients do not close them. A staff member should be appointed (such as the cleaner) to ensure that the windows and doors are open, according to the infection control plan. This may need to be done a few times a day.

Cross-ventilation, where there are two openings opposite each other to allow air flow, is the most effective. Outdoor waiting areas which are covered for protection from the rain, heat and sun are the most ideal. It is important to engage with your Ministry of Health to advocate for changes in your building to ensure better TB infection control, even if it means simple renovations to the building.

Wind-driven turbine vents ('whirlybirds'), or electric extractor fans may also be considered to ensure that air from within the facility is removed. A fan may also be strategically placed to assist in moving air out of a room in cases where natural ventilation is not adequate. Always ensure that the fan is placed in front of the clients and pushes the air from the patient out of the room, and not towards the healthcare worker.

The direction of the airflow and the level of ventilation should be assessed in your facility and improved, where possible. Draw a floor plan of your clinic, which includes a marking for where the windows and doors are. To assess circulation and dilution of air in different areas of the facility do the following:

- 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 (i.e. during working hours, and with windows as they normally are (i.e. 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: a) the direction of smoke (using a blue arrow); b) the speed at which smoke is moved. If smoke does not move, write an 'O' in that area; c) 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.
- From this baseline diagram you can assess which areas have poor ventilation and assess how they can be improved by opening windows and doors, placing fans and placing the greatest number of patients in the waiting areas with the best ventilation.

Public transport, factories, religious settings and homes also benefit from adequate ventilation. It is important that patients are educated about this to ensure that they implement infection control in areas outside of the health facility where people congregate.

Ultraviolet germicidal irradiation (UVGI)

UVGI units transmit UV light which kills TB bacteria when it shines on them for sufficient length of time and with enough brightness. UVGI units are a useful addition to ventilation which should be installed in waiting areas and consultation rooms if resources allow. UVGI does not replace ventilation. Properly designed and installed, upper room UV is associated with little or no hazards for patients.

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UVGI fittings are expensive and good TB infection control can be achieved in resource-limited settings without UVGI.

The World Health Organization recommends the following in facilities where UVGI is used:[3]

- Hire an engineer trained in UVGI, to design the type and placement of the units. They should also inspect the installation of the units to avoid costly mistakes.
- Ensure that there is adequate air mixing so that the mycobacterium is exposed and sterilised.
- Develop a UVGI procurement and maintenance plan; the budget should include both handling/shipping costs and import taxes.
- Have an agreement with suppliers or with district/provincial hospital engineers to measure lamp performance and maximum exposure at least yearly.
- Establish a cleaning and lamp replacement schedule based on manufacturer guidelines. Bulbs do lose their efficiency over time and must be replaced yearly.
- Keep a cleaning, replacement and maintenance log with dates and locations for all sites where UVGI is used in the facility.
- Incorporate UVGI preventive maintenance procedures into existing facility maintenance programmes.
- Staff need to be educated about use, safety and maintenance of UVGI.

Personal controls

Surgical masks for patients

Surgical paper masks do not stop TB particles from being inhaled, but they do stop TB particles from being released into the air. Surgical paper masks should not be worn by healthcare workers, but by patients. This will prevent TB from entering the air and people from becoming infected with TB.

Only advising that coughing or TB patients wear surgical paper masks can be stigmatising. Some programmes advise that all patients wear surgical paper masks in the waiting areas. Some patients may be unwilling to wear masks, but explain to them that by wearing paper masks, they are protecting all patients and their families, and fellow patients are in turn protecting them from TB. Surgical masks are relatively cheap and should be part of every TB infection control plan, where possible.

N95 respirators for healthcare workers

N95 respirators are different from surgical paper masks in that they stop particles from being released into the air and they protect the wearer from inhaling any TB droplets. The World Health Organization recommends that all staff working in high-risk roles in healthcare facilities should wear N95 respirators. Some facilities will also require other staff to wear N95 masks if there is a high risk of TB throughout the facility, but this is a facility-by-facility decision.

Staff should be trained on how to wear N95 respirator masks properly. 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:[4]

- 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 it is properly fitted.
- If the mask does not draw in towards your face, or you feel leakage at the edges, the straps should be adjusted by pulling back along the sides and/or reposition respirator.
- Repeat until mask is sealed properly.

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

Patients should be informed as to why staff wear respirators and patients use tissues, cloths or wear surgical face masks.

Conclusion

The three levels of infection control all need to be implemented together to ensure the best chances of preventing the transmission of TB. A lack of understanding of the risks of being infected with TB by patients and staff is often the greatest barrier to the implementation of TB infection control. Creating an enabling environment for TB infection control can be achieved by educating healthcare workers and patients.

Additional resources

1 *WHO policy on TB infection control in health-care facilities, congregate settings and households.* World Health Organisation, Geneva, 2009. Available at http://whqlibdoc.who.int/publications/2009/9789241598323_eng.pdf

2 *Implementing TB Infection Control in health facilities*. Wits Reproductive Health and HIV Unit (formerly RHRU), Johannesburg, 2009. Available at: www.tbpreventiontoolkit.org/sites/tbpreventiontoolkit.org/files/references/tbic/training/Implementing%20TB%20IC%20at%20HCF_S%20Africa_Witwatersrand%20U.pdf

3 *Tuberculosis Infection Control: A Practical Manual for Preventing TB,* Francis J. Curry National Tuberculosis Center, San Francisco, 2007. Available at www.ndhealth.gov/disease/tb/Documents/Infection%20Control.pdf

4 *I -TECH TB Prevention Toolkit, TB Infection Control Training Resources. Available at www.tbpreventiontoolkit.org/tbic/training*

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Infection control posters developed by CDC - South Africa (Global AIDS Program)

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TB Infection Control in HIV Clinics and Out-Patient Settings: a Team Approach*

Every Person Counts!

Clinic Administrator

- Endorse and fund a written TB infection control plan for the facility.
- Provide support for best use of facility space to reduce TB transmission.
- Appoint an Infection Control Focal Person for TB infection control.
- Ensure that supplies and equipment for infection control are available.

Infection Control Focal Person

- Develop and implement a facility plan for TB infection control based on a facility assessment.
- Arrange waiting areas to ensure that patients are in well-ventilated areas-outside, if possible.
- Ensure coughing patients are separated from others and given high priority for clinical examination.
- Ensure examination rooms are well-ventilated with open window policies and use of fans.
- Conduct on-site training for all staff in implementing TB infection control practices.
- Provide a TB prevention and care program for health care workers. Keep a record of those who develop active TB disease to monitor infection control.
- Regularly evaluate activities to ensure that prompt patient triaging, TB screening, and follow-up are occurring.
- If available, UV lights must be used properly and regularly maintained.

Admissions Clerk

- Give coughing patients tissues, cloths, (or surgical masks when possible) and instructions to cover their cough.
- Identify and send coughing patients to a separate waiting area.
- Prioritize TB suspects to see a clinician quickly.

Clinicians and Nurses

- Screen all HIV-positive and other symptomatic patients for TB.
- Ensure that patients are evaluated and receive TB treatment as soon as possible.
- Wear particulate respirators (N-95 / FFP2) when caring for TB patients and suspects, especially those with suspected MDR or XDR-TB.**
- Send patients outside for sputum collection or to a well ventilated collection area.

Patients

- Cover your mouth and nose with a tissue or cloth when you cough.
- Put your used tissue in the wastebasket.
- Protect others by wearing a facemask if asked to do so.
- Wash your hands with soap and water after coughing or any contact with face or mouth.
- Take prescribed medications regularly and complete TB treatment.

Laboratory Staff

- Ensure that sputum cups are available.
- Work with the team to develop procedures to ensure that results are returned to clinicians quickly.
- Be aware of laboratory TB infection control procedures.

Entire Team

- Be vigilant of infection control policies and procedures, such as triaging coughing patients, keeping windows open, and respiratory hygiene.
- Ensure that patients are informed about the basic concepts of TB transmission.
- Know the signs and symptoms of TB and seek care promptly if you think you may be infected.
- Meet regularly to discuss ways to improve TB infection control policies and procedures in the clinic.

* Based on the 2009 WHO Policy on TB Infection Control in Health-Care Facilities, Congregate Settings, and Households.
** Multidrug-resistant tuberculosis (MDR-TB) and Extensively drug-resistant tuberculosis (XDR-TB)

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