8. TB prevention and control care in prisons

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Key points

- TB in prisons is a major public health problem in many settings, particularly in countries with a high incidence of TB.
- The TB notification rate in prisons ranges from 11 to 81 times higher than in the general population. The situation is worsened by the emergence and spread of drug-resistant TB, particularly multidrug-resistant (MDR) and extensively drug-resistant (XDR) TB.
- Prompt detection of TB among prisoners should be ensured through a combination of screening methods (screening on entry, mass screening at regular intervals, passive screening, contact screening) based on clinical questionnaires, chest X-rays, smear microscopy and self-referrals.
- The implementation of new, rapid diagnostic methods such as Xpert MTB/RIF is an important breakthrough in the fight against TB and (X)MDR.
- Drug susceptibility testing (DST) should be performed on all patients with treatment adapted to the resistance pattern to help further amplification of resistance.
- Effectiveness is improved when treatment is administered under the direct observation of health care staff and in line with national TB programme (NTP) guidelines.
- Adequate procurement, supply and management of quality medication and effective administration should be in place. Airborne infection control, including protective measures for staff, should be ensured, and provider-initiated HIV counselling and testing to detect HIV and TB/HIV co-infected individuals should be promoted to provide the necessary support and care.
- Continuity of care is imperative for released prisoners who are on treatment and for individuals who are on treatment before entering the prison services.
- TB control is strengthened in prison-based programmes by raising awareness of TB among prisoners and prison medical and non-medical staff through continuous educational activities.
- Operational research should be promoted to contribute to evidence-building for effectiveness.

Introduction

TB is a major global health and public health problem. There are clear challenges in two regions of the world: Africa (where there is also a high prevalence of HIV infection) and eastern Europe. In eastern Europe, the situation is serious due to MDR and XDR forms of TB and inadequate responses by health systems, leading to poor case management and the further emergence of drug-resistant cases. The situation in parts of Europe and central Asia has recently been aggravated by the increasing prevalence of HIV infection in certain populations, which considerably increases the risk of active TB in those infected with both TB and HIV *(1)*.

The scourge of TB in prisons remains a persistent problem. The occurrence of active TB in prisons is generally reported to be much higher than the average levels reported for the corresponding general population. In the last survey of TB control in Europe, undertaken in 2006, it was estimated that European prisons notify TB at an average rate of 17 times more than in the population at large, ranging between 11 times more in western Europe to 81 times more in eastern Europe *(2)*. TB in prisons is a major cause of death and constraint for TB control in the civilian system, especially in countries with a high incidence of TB.

High levels of TB in prison populations are likely to be attributable to the fact that a disproportionate number of prisoners are from population groups already at high risk of TB infection and TB disease, such as people who inject drugs, homeless people, mentally ill individuals, people returning to prison and undocumented immigrants from areas with a high incidence of TB.

Prison settings, where segregation criteria are based on crime characteristics rather than on public health concerns, may facilitate transmission. Overcrowding, late detection and treatment of infectious cases, frequent transfers between prisons and poor airborne infection control measures are all factors contributing to transmission of TB *(3)*. Prisoners may be at higher risk of TB disease following a recent infection or reactivation of latent infection through co-immune-depressing pathologies, particularly HIV infection, intravenous drug use and poor nutritional status *(4)*. Moreover, prisons represent a reservoir for transmission of the disease to the community at large through prison staff, visitors and close contacts of released prisoners with still active TB disease *(5)*. The transmission dynamics between prisoners and the general population have been hypothesized as playing a key role in driving overall population-level incidence, prevalence and mortality rates of TB. Neglecting TB prevention

and control in prisons settings can, therefore, carry serious consequences for both prisoners and the general population, especially in countries with poorly performing NTPs and high incarceration rates.

On 13 October 2010, the Global Plan to Stop TB 2011–2015 was launched by the Stop TB Partnership (a coalition of more than 1000 organizations worldwide), with the aim of halving TB mortality and prevalence rates by 2015 compared to the 1990 baseline *(6)*. One of the main objectives in achieving this aim is to ensure the early diagnosis of all TB cases, including in vulnerable populations such as prisoners.

In 2013, the International Union against Tuberculosis and Lung Disease published an official statement urging health authorities, national and international technical agencies, civil society organizations and donor agencies to prioritize the prevention and control of TB in prison settings, with recommendations for 12 points for action *(7)*.

Transmission

TB is an infectious disease caused by a bacillus named *Mycobacterium tuberculosis*. Transmission occurs by airborne droplets produced by coughing, sneezing or talking that are subsequently inhaled by contact people *(8)*. The risk of inhalation increases when several coughing people are kept in a small, unventilated room. The risk of TB being transmitted in settings in which people are in close contact (as in prisons and hospitals) is particularly high. Thus, prisons provide ideal conditions for TB transmission.

In general, about 30% of contact people that inhale bacilli become infected. But in prisons with overcrowding, twice as many contacts or more could become infected *(9)*. Smoking seems to aggravate the risk of becoming infected.

How are people exposed to TB? Exposure results from breathing the air containing the *M. tuberculosis*. Once an infectious TB patient breathes, sneezes or coughs, mycobacteria are spread in the air which can be inhaled by a healthy individual. Three factors play a role: the number of infectious patients, the duration of their infection and the intensity of the contact with them. Thus, by reducing the duration of infectiousness, or the contacts between infectious TB patients (such as prisoners), exposure can be reduced.

Despite being infected with *M. tuberculosis*, a person can stay healthy and never become sick. Most will remain at the stage of subclinical infection. That means they have been infected but are healthy. Only about 10% will progress to disease, of whom half will develop an infectious form of TB, while the other half will develop a non-infectious form.

However, when a person's immune system is affected (through, for example, HIV infection, chemotherapy for cancer, old age, stress or imprisonment), the infected person will be more likely to develop TB disease. TB can affect any organ or part of the body, but especially the lungs. The pulmonary form of TB is that which is infectious through transmission of airborne droplets. Indoors, droplets produced by coughing or sneezing can remain airborne for extended periods of time, especially if the ventilation is poor.

When no treatment is available, at least half of those with TB disease die within two years. Some may heal spontaneously and others become chronic cases that continue to transmit the disease.

Five factors in the spread of TB in prisons are described in the *Guidelines for control of tuberculosis in prisons (10)*, as follows.

Prisons receive TB. Prisoners mainly come from communities with high rates of TB, unhealthy lifestyles and addictions. As a result of ignorance or lack of means, they may enter prisons with untreated TB. Moreover, conditions for drug resistance are often created when prisoners arrive with partially treated TB or their treatment is interrupted upon arrival.

Prisons concentrate TB. Overcrowding, poor ventilation (lack of windows, or covering them to block cold air entering the cell) and prolonged incarceration inside prison cells are all factors conductive to the transmission of airborne infection. If a TB patient in the community can infect 15–20 people a year, a TB patient in prison could infect significantly more.

Prisons disseminate TB. In many countries, the lack of funding and management and the absence of laboratories and trained staff result in TB cases going undetected. Individuals with undetected TB can easily disseminate TB inside the prison system as they often move from one prison to another.

Prisons make TB worse. Several factors contribute to the worsening of TB disease in prison, including delayed diagnosis (caused by, for example, absence of entry screening, lack of trained staff and overload of medical personnel by overwhelming numbers of prisoners entering the system, weak infrastructure, bad organization of laboratory services and disruption of drug supply) and frequent interruptions to or incomplete

treatment (medical records do not always follow prisoners during regular prison transfers or on release). Many factors occurring in prison might worsen poor treatment outcome: malnutrition, drug addiction, mental stress, poorly treated co-morbid diseases (such as HIV, diabetes and hepatic insufficiency) and factors related to weak health services in the system.

Prisons export TB. Prisoners may export disease to the outside world through contact with prison staff and visitors, as well as when prisoners are released who have not finished their treatment. Prisons are reservoirs for the transmission of resistant forms, especially as release often takes place during the lengthy period of MDR-TB treatment (18–24 months).

What can be done to reduce the risk of transmission of TB? Interventions to interrupt the cycle of transmission can be directed at: (i) preventing transmission of TB from people with infectious TB to their contacts; and (ii) preventing the disease from developing once any contacts have become infected. To prevent transmission, early case detection, immediate and adequate treatment and infection control interventions are needed. To prevent infected contacts from developing active disease, preventive chemotherapy should be considered.

Case-finding

Case detection is one of the core elements of TB control. If conducted properly, systematically and effectively and followed by an adequate treatment regimen, it could lead to a reversal of the growing incidence of TB and to a reduction in TB mortality.

There are two strategies for case-finding: (i) through self-referral and passive case-finding during incarceration; and (ii) through regular active case-finding during incarceration.

Passive case-finding

Passive case-finding examines TB suspects (individuals who have had a cough for three weeks or more) among people who spontaneously visit health centres seeking care for respiratory symptoms. It presumes that there is complete access to health services, without which there may be delays in case-finding. For case-finding to be effective, patients must be aware that the symptoms they experience may be symptoms of TB and that TB can be treated. They must be willing to seek diagnosis and treatment and must be able to access TB care. Educating everyone in prison about TB is, therefore, important.

Passive case-finding may, however, have limited success in prisons. Some inmates may be afraid to come forward, fearing the repercussions of a diagnosis of TB such as stigma, a delay in release or a transfer to another prison. TB disease may indeed be a reason to transfer a prisoner to a better setting, so there could be a secondary gain for some prisoners to try to be diagnosed with TB. Sometimes inmates may not be allowed to seek care because of their place in the internal prisoner hierarchy.

Active case-finding

Active case-finding involves the screening of prisoners at different points during their incarceration and the use of various methods, including questionnaires, chest radiography, tuberculin skin testing and immunoglobulin gamma interferon assay (IGRA), or a combination of these methods.

In prisons, passive and active case-finding should be carried out simultaneously and systematically. A combination of these two approaches will substantially increase case detection.

Some of the advantages and disadvantages of conducting passive and active case-finding are detailed in Table 4.

Screening strategies

How screening activities should be implemented depends on many factors, including the type of facility, the prevalence of TB infection and disease in the facility, the prevalence of TB in the inmates' communities, the prevalence of other risk factors for TB (such as HIV) in the inmate population and the average length of stay of inmates in the facility. The type of screening recommended for a particular facility is determined by an assessment of the risk of TB transmission within that facility *(11)*.

Screening for TB on entry

The revised European Prison Rules *(12)* state that prisoners are entitled to a medical examination at the point of first admission (§42) and that prison authorities have to safeguard the health of all prisoners (§39).

Screening on entry is aimed at detecting undiagnosed TB (among other things) and identifying patients who were receiving treatment before incarceration to ensure that they complete their treatment.

Medical screening on entry into the prison system is essential, as many prisoners come from communities with a high prevalence of TB. Prisoners should not enter the body of the prison population until it has been verified that they do not have infectious TB. When possible, newly arrived prisoners should not be housed with other inmates until they have been properly screened for TB.

Table 4. Advantages and disadvantages of passive and active case-finding

Passive case-finding	Active case-finding
Advantages	
• Identifies cases missed through other case-finding measures (such as entry screening, contact investigation, mass screening or surveys). • Identifies cases who develop TB after entry. • Is relatively less expensive and simpler for programmes to implement.	• Increases case notification; links the prison health system to the NTP and feeds data into the system. • Reduces delays and thus transmission through immediate removal of infectious cases by separating them from the general prison population and providing effective treatment. • If done early, makes it easier to treat patients detected in the early stages of TB. • Is likely to find prevalence rates much higher than the prevalence rates outside the prison, which can be a useful tool for advocacy.
Disadvantages	
• Relies on patients' readiness to attend medical services for evaluation (self-referral). • May result in delayed case-finding and initiation of treatment, with prolonged chances of transmission to others. • May result in advanced disease that can be more difficult to treat. • May be biased by internal regulating mechanisms among prisoners (for example, bullying or corruption) leading to a denial of access to the medical ward to certain subgroups by the "prisoner bosses".	• Increases duties and workload of the health staff in prison, who are already limited in number and may not be sufficiently motivated. • Is a burden on the penal and public health care system, which needs to support active case-finding activities; the high cost may render these activities unsustainable. • Overburdens the capacity of local health centres and hospital laboratories to respond to increases in smear and culture examinations. • Diverts funds from other directly observed treatment, short course (DOTS) activities. • Leads to potential over-diagnosis of TB, if diagnosis is only based on radiography.

Source: Dara M et al *(10)*.

This initial and temporary segregation is an opportune time to check for TB.

Entry screening should be documented on the screening register and must be followed up with standard procedures for diagnosis and treatment.

Contact investigation

In prisons, TB contacts are persons who share air for prolonged periods with an active TB case. These include the following: all prisoners who sleep in the same cell or housing unit as the TB patient, prisoners who spend time in closed or poorly ventilated work areas inside the prison, prisoners who interact with the TB patient during recreational activities, prison staff who come into contact with a TB case and visitors.

The *Guidelines for control of tuberculosis in prison* recommend *(10)* screening for TB among contacts of sputum-smear-positive cases, as these patients are infectious. Contacts should be identified through an interview with the patient regarding his social network and daily activities to help to identify groups of contacts who might be exposed. The next step will be contact investigation by sputum-smear microscopy or chest radiography.

Mass screening

Mass screening means to check the whole population of prisoners (or other segment of population) to identify suspected cases of TB and confirm diagnoses by sputum-smear or other examinations. Two factors are obligatory with mass screening: it should cover the whole population group, and rounds must be regular. In the prison system, two massive screening rounds a year are ideal. This strategy is very useful to find previously undetected cases missed by passive case-finding. Mass screening is not, however, recommended as the sole method of case-finding in prisons. It is preferable to start with mass screening in the initial phases of project implementation and complement it with other screening strategies (on entry, passive) to ensure that prisoners with TB who enter prison or cases that occur between mass screening rounds are detected properly. Moreover, regular mass screening may not be sustainable in resource-limited settings due to cost and other logistical barriers. Thus, this intervention may be reserved to places where resources permit.

Screening methods

Symptom screening

Whenever possible, health care workers should conduct screening by special questionnaire *(10)*. The questionnaire should be based on three crucial aspects: history of former TB disease (previous treatment, interrupted treatment), clinical symptoms and body/mass index. Prisoners who have a previous history of TB and/or clinical symptoms such as coughing for more than two weeks, sputum production, fever, night sweats, loss of weight and appetite, haemoptysis, chest pain and/or low body mass index may be considered as suspects for TB. All prisoners with signs or symptoms suggestive of TB should undergo a thorough medical evaluation, with confirmation of the diagnosis by smear investigation.

The questionnaire as a screening method can be used widely, as it is less expensive than radiography, is rapid, simple, does not require special equipment and is easy to implement. Its major disadvantage is that the predictive value of a positive test (the probability of smear-positive TB occurring among those identified as suspects) is likely to be low, resulting from a high false-positive rate for the questionnaire. Thus, it is very important that case-finding staff should be trained in interview techniques and the correct completion of the questionnaire *(10)*. A standardized approach should be emphasized and staff should avoid guiding a prisoner to one answer or another. Merely giving the questionnaires to the prisoners for self-completion is unacceptable. Symptom screening alone is adequate and satisfactory in facilities with a minimal risk of TB (those with a small population or no cases in the previous year).

Screening through chest radiography

Many industrialized countries screen prisoners on entry by chest radiography. Studies show the utility of such screening in finding prisoners who would have been missed by symptom screening alone *(13)*. Prisoners with abnormal chest radiography are then followed up with sputum examination. Most east European countries use mobile miniature radiography. Unfortunately, the overwhelming majority are old-fashioned machines, produced 30–40 years ago, which causes significant logistical problems and errors in reading and interpretation. The use of mobile miniature radiography is not recommended unless it is digital, which provides a high-quality image.

Digital radiographs (miniature or full-size) provide enhanced imaging and improved storage and readability. A miniature radiograph can be performed in under a minute and exposes the patient to approximately one tenth of the radiation dose of a conventional radiograph. One cost–effectiveness analysis of miniature chest radiography for TB screening on admission to jail indicated that more cases were detected with this method than either tuberculin skin test or symptom screening, and the cost of radiograph screening was less per case detected *(14)*. The extent to which radiological screening is used in a given institution should be dictated by multiple factors, including: the local epidemiological characteristics of TB disease; inmates' length of stay; the ability of the health-care professionals in the facility to conduct careful histories, tuberculin skin or QuantiFERON-TB Gold testing and cross-matches with state TB registries; and the right time for the radiographic study and its interpretation. Screening with chest radiographs might be appropriate in certain jails and detention facilities that house substantial numbers of inmates for short periods and serve populations at high risk of TB (such as those with a high prevalence of HIV infection or history of injection-drug use and foreign-born persons from countries with a high prevalence of TB). In facilities where routine radiographic screening for all inmates is not carried out, a chest radiograph should be part of the initial screening of HIV-infected patients (often missed at a sputum-smear screening because of infiltrative TB infection in their lungs) and those who are at risk of HIV infection but whose status is unknown *(11)*.

Other screening methods

The tuberculin skin test and IGRA are used for the detection of latent TB infection. Countries with a low incidence of TB sometimes use tuberculin skin test and IGRA in correctional institutions *(11)*. Tuberculin skin test and IGRA can only indicate an infection but not active disease. The use of these tests is not, therefore, recommended in prisons in countries with a high incidence of TB, where most prisoners are already infected with TB and the

priority for TB control programmes is to detect and treat active TB cases.

Clinical features of TB

The disease starts in the lungs after inhalation and is most frequently manifested in the lungs as pulmonary TB. An immune system response causes the formation of abscesses in the lung's parenchyma. As long as these abscesses are contained, there is little risk of transmission (closed TB), but if these abscesses break through into the airways, the infectious content will be coughed up (open TB). Abscesses contain billions of bacilli so that people with open TB are highly infectious. About 50–60% of people with TB eventually become infectious. In cases with weak immune defences that prevent the formation of an abscess (such as HIV infection), the lung's parenchyma has a more diffusive inflammation which does not damage airways and bacilli do not break through. These cases are less infectious.

The bloodstream can carry bacilli to other parts of the body situation, which occurs in about 15–20% of people with TB. Almost all organs can be affected and sometimes serious illnesses, such as meningitis or septicaemia, may occur.

The most important symptoms of active TB are cough, haemoptysis, chest pain, breathlessness, fever, night sweats, fatigue and loss of appetite *(8,9)*. Productive cough is the most common symptom of pulmonary TB. The presence of a cough is, however, non-specific: having the cough for three weeks or more is a criterion for defining the patient suspected of TB disease.

Diagnosis

Chest radiography

The introduction of radiography as a diagnostic and screening tool was an important landmark in the knowledge of the natural history and diagnosis of TB in humans. Practical experience and some studies have, however, proved that no radiographic picture is absolutely typical of TB *(15)*. Many diseases of the lungs show a similar radiographic appearance and can easily imitate TB. Chest radiography can undoubtedly be very helpful in localizing abnormalities in the lung and indicative lesions of TB, but *only bacteriology can provide the final proof of TB*.

The efficacy of chest radiography is determined largely by the reader's ability to detect abnormal opacities and interpret them correctly. This ability varies from one reader to another (inter-individual variation). It also happens that a reader may, on first examination of a film, see abnormalities that he/she does not see after a week or so when re-examining the same film. On the other hand, at the second reading, the reader may find new abnormalities on a film that were not seen at the previous examination (intra-individual variation).

The high number of false TB cases over-diagnosed by chest X-ray largely exceeds the number of those missed by smear microscopy. Moreover, X-ray and mobile miniature fluorography are expensive, require specially trained technicians and may face interruption in services in some settings due to breakdown of equipment, lack of spare parts and repair experts, scarcity of films and shortage of electricity.

The most important indication for chest radiography is when there are negative sputum smears by microscopy (two negative smears, or at least one culture negative, or both) but a clinical suspicion of TB. The diagnosis of bacteriologically negative TB is, therefore, presumptive and must be based on epidemiological and clinical information and failure to respond to a full course of broad-spectrum antibiotics to exclude other lung infections. A chest X-ray is also required if the patient has breathing difficulties, haemoptysis or suspected pleural or pericardial effusion, or may need specific treatment (such as pneumothorax). Radiography also plays an essential role in the diagnosis of TB in HIV-positive patients who may not have abnormalities in X-ray (12–14%). Digital radiography has the advantage of producing instant results which can be assessed remotely through an online transfer of the image.

Sputum-smear microscopy

Direct sputum-smear microscopy certainly has some technical shortcomings, but its operational advantage is obvious. That a diagnosis of TB (in persons producing large amounts of bacilli) may be established with certainty and chemotherapy started on the same day is without doubt the greatest advantage of smear microscopy. Direct smear microscopy is not, however, sensitive enough to detect TB bacilli in sputum when the number of bacilli is small. It requires a high volume of bacilli in the specimen (around 10 000 per ml) to be read positive by an experienced laboratory technician. Direct smear microscopy is comparatively inexpensive and fast, does not require sophisticated equipment and can be carried out by trained technicians in primary care settings. Consequently, it is the method of choice for early identification of TB cases in low-resource settings.

Sensitivity for detection of TB bacilli in sputum increases substantially if the sputum is concentrated (decontaminated and centrifuged) and stained with fluorescent solutions (such as auramine O). Slides can

then be observed through a special microscope, such as a fluorescent or a light-emitting diode microscope. This technique requires lower magnification while examining the slides and reduces the time of observation. Thus, more slides can be read in less time. Prisoners suspected of having pulmonary TB should submit two samples to establish a diagnosis of TB. It is preferable to obtain early morning sputum as this is more likely to contain tubercle bacilli. The way sputum is produced is also very important. Sputum samples should be submitted following instructions from and under the supervision of a health care worker to ensure sampling with the right technique and from the right person. Samples should be collected in a well-ventilated area (better outdoors). In some prison settings, inmates may exchange their sputum samples or use other practices to get positive results from the sputum smear, so staff need to observe the production of the sample, using personal protective measures (filter face-piece 2 or N95 respirators) and/or other infection control measures.

Culture

Culturing a specimen means growing the bacilli on media, which are substances that contain nutrients, in the laboratory. Lowenstein Jensen is the most frequently used solid media. Not all TB patients have positive smears. If there are only a few bacilli in the sputum (around 10–20) the smear will appear negative but the culture will usually be positive. A positive culture is proof of TB. The isolation of TB bacilli in sputum (and other clinical specimens) through culture, with further biochemical or molecular tests for identification, constitutes a definitive diagnosis of TB. The sensitivity of the culture is substantially higher than that of smear microscopy; sputum-smear microscopy detects only up to 50% of culture-confirmed pulmonary TB cases. The technical superiority of culture over smear microscopy is largely due to quantitative factors. Usually only about 1–3% of the smear is examined by microscopy, whereas in the culture tube the whole yield of colonies may be seen practically at a glance. Although a large proportion of organisms are destroyed by decontamination procedures, the quantitative differences are still so large that the probability of finding bacilli by culture is many times greater than it is by direct smear microscopy. The importance of its use to confirm disease should, therefore, be emphasized, especially among HIV-infected individuals, who are frequently smear-negative.

Additionally, this method allows for identification of drug-susceptibility patterns, which is crucial for guiding therapeutic management. Culture and DST should, therefore, be considered for all TB patients who are suspected of being infected with multidrug-resistant strains. Culture is part of the routine work-up when evaluating TB suspects in industrialized countries.

However, important factors limit the widespread use of culture in developing countries. Traditional culture methods in solid media (Lowenstein-Jensen) require decontamination, homogenization and centrifugation of samples, which implies more equipment (such as a centrifuge and biosafety cabinets) and higher maintenance costs. Personnel require more training. These procedures produce more aerosols containing the TB bacilli, so the laboratory staff have to be adequately protected. The growth of TB bacilli in solid media can be observed within four to six weeks. More rapid culture results may be obtained through the use of automated or semiautomatic methods that make use of liquid media. These include the mycobacteria growth indicator tube (the BACTEC MGIT 960 system can detect results as early as one to two weeks) and molecular line probe assay, which can indicate the presence of *M. tuberculosis* within 12 hours.

Laboratories carrying out culture (especially rapid diagnostic methods) and DST need safety measures for staff. Such facilities are expensive to build and run, and maintenance and running costs may render them inaccessible to some TB programmes in prisons.

Alternatively, an adequate network of smear microscopy sites should be set up inside the prison system, so that peripheral prisons/colonies have easy and rapid access and the number of tests carried out is still sufficient to ensure adequate quality. The network in the prison system should be coordinated with the network of outside laboratories in the civilian sector and should be part of a laboratory quality assurance system.

Xpert MTB/RIF diagnostic molecular test

The development of the Xpert MTB/RIF assay for the GeneXpert platform was completed in 2009 and is considered an important breakthrough in the fight against TB. For the first time, a molecular test is simple and robust enough to be introduced outside conventional laboratory settings. Xpert MTB/RIF detects *M. tuberculosis* as well as rifampicin resistance-conferring mutations using three specific primers and five unique molecular probes to ensure a high degree of specificity. The assay provides results directly from sputum within 100 minutes, even in sputum-smear negative samples.

WHO strongly recommends that Xpert MTB/RIF should be used as the initial diagnostic test in individuals suspected of having MDR-TB or HIV-associated TB *(16)*. The recommendations apply to the:

- use of Xpert MTB/RIF in sputum specimens (including pellets from decontaminated specimens) (data on the utility of Xpert MTB/RIF in extrapulmonary specimens are still limited);

- use of one sputum specimen for diagnostic testing, acknowledging that multiple specimens increase the sensitivity of Xpert MTB/RIF but have major resource implications;
- use in children, based on the generalization of data from adults and acknowledging the limitations of microbiological diagnosis of TB (including MDR-TB) in children.

Access to conventional microscopy, culture and DST is still needed for monitoring therapy, for prevalence surveys and/or surveillance, and for recovering isolates for drug susceptibility testing other than rifampicin (including second-line anti-TB drugs).

WHO's analyses of progress towards meeting the projected diagnostic targets in the *Global Plan to Stop TB, 2011–2015 (6)* show that:

- for MDR-TB: implementing Xpert MTB/RIF to meet diagnostic targets for MDR-TB will cost less than conventional culture and DST for diagnosis of MDR-TB, both globally and in varied country settings, requiring less than 1% of current funding for TB control;
- for HIV-associated TB: the cost of testing all HIV-positive individuals suspected of having TB will be similar to the cost of conventional culture for diagnosis of TB, requiring 1–2% of current funding for TB control and amounting to <1% of current expenditure on HIV care in several countries with high burdens of TB-HIV;
- testing all persons suspected of having TB will be strongly dependent on screening and diagnostic algorithms at the country level; in both low- and middle-income countries, pre-test screening strategies should be considered to optimize the efficiency and cost of Xpert MTB/RIF.

WHO recommends that the following groups of people should receive Xpert MTB/RIF tests as a primary diagnostic test:

- people who have been treated with anti-TB drugs and in whom pulmonary TB has again been diagnosed, that is, all retreatment categories (failure, default, relapse);
- people suspected of having pulmonary TB and considered to be at risk of harbouring MDR-TB bacilli (risk groups as per national policies or as defined in WHO's *Guidelines for the programmatic management of drug-resistant tuberculosis, emergency update 2008 (17)*);
- all people living with HIV who have signs or symptoms of TB, those seriously ill and suspected of having TB regardless of HIV status, and those with unknown HIV status presenting with strong clinical evidence of HIV infection in HIV-prevalent settings.

Xpert MTB/RIF is suitable for use at district and sub-district level and should not be restricted to the central/reference laboratory level only.

It is considered essential that, in eastern European countries, Xpert MTB/RIF assay is placed in central prison hospitals or special TB colonies or facilities where prisoners receive TB treatment.

The introduction of Xpert MTB/RIF assay simplifies and changes the diagnostic algorithm. In eastern European prisons, where the X/MDR-TB level is significantly high, the following algorithm is proposed: all prisoners suspected of TB or X/MDR-TB should undergo smear investigation by microscopy. Regardless of the smear status, every case should receive the Xpert test (if resources are limited, priority should be given to the MDR high-risk group). Based on the results of the test, three groups should be defined: (i) no TB →further clinical management; (ii) confirmed TB but no RIF resistance →treat with first-line drugs; (iii) confirmed TB with RIF resistance →treat with second-line drugs.

Although testing with Xpert MTB/RIF does not require additional laboratory equipment, the sophisticated nature of the device requires careful handling, that is, a stable and uninterrupted electrical supply to avoid interruption of the procedure and subsequent loss of results, security against theft, adequate storage space for the cartridges, dedicated staff to perform testing and biosafety procedures similar to microscopy.

Treatment

The aims of treatment for TB are to cure the patient and restore quality of life and productivity, to prevent death from active TB or its late effects, to prevent relapse of TB, to reduce transmission of TB to others and to prevent the development and transmission of drug resistance.

There are five anti-TB first line drugs: rifampicin (R), isoniazid (H), ethambutol (E), pyrazinamid (Z) and streptomycin (S). Rifampicin and isoniazid are the most powerful bactericidal medicines active against TB bacilli. In prison settings, a daily treatment is recommended and the whole process should be under the direct supervision of a health-care worker *(16)*. WHO recommends the use of fixed-dose combination drugs as they are thought to improve adherence, errors in prescribing are avoided and the number of tablets to be ingested is reduced *(18)*.

New patients (who have no history of previous TB treatment or who have received anti-TB drugs for less than one month) with pulmonary TB should receive a regimen including six months of rifampicin. In the

intensive phase the patient receives isoniazid, rifampicin, pyrazinamide and ethambutol daily for two months, and in the continuation phase isoniazid and rifampicin for four months (2HRZE/4HR).

Since in many settings, particularly prisons, the risk of drug-resistant TB may be high, it is highly recommended that the resistant pattern of the strains the patient is infected with is documented and the appropriate treatment administered accordingly.

The treatment for patients who have previously been treated is more complicated and depends mainly on facilities' diagnostic capacity. The Consolidated Action Plan to Prevent and Combat Multidrug and Extensively Drug-Resistant Tuberculosis in the WHO European Region 2011–2015 sets a target for all previously treated patients to have access to DST at the beginning of treatment by 2015 *(19)*. The purpose is to identify MDR-TB as early as possible so that the appropriate treatment can be given. Specimens for culture and DST should, therefore, be obtained from all previously treated TB patients at or before the start of treatment. It is highly recommended that people living with HIV and new TB cases in settings with higher than 10% of MDR-TB among new cases should be tested for drug susceptibility. If resources allow, DST should be performed for all patients. It should be performed for at least isoniazid and rifampicin.

The approach to the initiation of retreatment depends on the laboratory capacity of the country/institution, specifically when (or if) DST results are routinely available for the individual patient. Countries using rapid molecular-based DST will have results for rifampicin/isoniazid available within one to two days; these results can be used in deciding which regimen to start for the individual patient.

The use of conventional DST methods yields results within weeks (for liquid media) or months (for solid media). Because of this delay, prison health facilities using conventional methods will need to start an empirical regimen while DST results are awaited and then modify the regimen based on the DST results. Alternatively, treatment might be started with the standard re-treatment regimen, which includes streptomycin and lasts for eight months (2HRZES/1HRZE/5HRE), and modified once the DST results are available.

Where DST is not yet routinely available for individual retreatment patients, an interim approach could be implemented while the country is strengthening its laboratory system. Under this exceptional circumstance, an NTP/health ministry may consider a short-term policy of directly starting patients from such a group on an empiric MDR-TB regimen without confirmation of isoniazid and rifampicin resistance. This is a temporary measure, while the country is building the laboratory capacity to perform routine DST for individual retreatment patients. Groups of patients whose likelihood of MDR is medium or low will receive the eight-month (full course) retreatment regimen with first-line drugs (2HRZES/1HRZE/5HRE).

It is obvious that implementation of Xpert in prison facilities will shorten the delay between date of diagnosis and initiation of treatment. In fact, a doctor can diagnose TB, determine whether the case is drug-resistant and initiate treatment, all in one day.

MDR-TB

The European Region has the highest rate of MDR-TB in the world, which illustrates the failure of health systems to treat the disease effectively. Additionally, the social determinants contributing to the emergence and spread of the disease still prevail in most settings. People living with HIV, migrants, prisoners and other vulnerable populations are at most risk. Despite the availability of new diagnostic techniques, only one third of estimated MDR-TB cases are diagnosed, and only two thirds of these are reported as receiving adequate treatment. Based on a decision of the sixtieth session of the WHO Regional Committee for Europe in 2010, the Consolidated Action Plan to Prevent and Combat Multidrug and Extensively Drug-Resistant Tuberculosis in the WHO European Region 2011–2015 *(19)* has been developed to strengthen and scale up efforts to address the alarming problem of drug-resistant TB in the Region. Another important document issued by WHO regarding MDR-TB is the 2011 update of *Guidelines for the programmatic management of drug-resistant tuberculosis (20)*.

An MDR-TB case is defined as a patient who is identified as infected with a strain that is resistant to at least isoniazid and rifampicin. XDR-TB is a case that is resistant to isoniazid, rifampicin, plus any fluoroquinolone, and at least one of three second-line injectables – amikacin, kanamycin or capreomycin.

From a microbiological perspective, resistance is caused by a genetic mutation that makes a drug ineffective against the mutant bacilli. Although its causes are microbial, MDR-TB essentially results from clinical and programmatic mistakes.

There are three main causes of drug resistance:

- *mistakes caused by health care workers, inadequate regimens*: inappropriate guidelines, non-compliance with guidelines, absent guidelines, poor training, no

monitoring of treatment, poorly organized or funded TB control programmes, poor adherence (or poor DOTs, unmotivated staff);
- *inadequate supply or poor quality of medicine*: unavailability of certain medicines (stock-outs or delivery disruptions), poor quality manufacturing, poor storage conditions, wrong dose or combination;
- *inadequate medicine intake*: poor adherence, lack of information, lack of money (no treatment available free of charge), lack of transport, adverse effects, social barriers, malabsorption, substance dependency, disorders.

The only way to confirm MDR-TB and XDR-TB is through DST of first- and second-line medicines, respectively. For the purposes of the recommendation, the expert group considered a rapid test as one providing a diagnosis of resistance to isoniazid and rifampicin or rifampicin alone within two days of specimen testing. Only molecular tests can detect resistance so fast, of which two technologies (line probe assay and Xpert MTB/RIF) are currently recommended for use by WHO *(20)*. Conventional DST of cultured mycobacteria typically provides results within one to three months.

The best strategy for averting deaths and preventing acquired MDR-TB is to carry out DST in all patients before treatment, using a rapid test that detects resistance to isoniazid and rifampicin. The modelling work showed that rapid testing of both isoniazid and rifampicin at the time of diagnosis was the most cost-effective testing strategy for any patient group or setting, even at very low levels of resistance among TB patients. For previously untreated patients, DST at the start of treatment was a better strategy than waiting to test only those patients who remained sputum-smear-positive later in the course of their first-line treatment.

A short time to diagnosis may influence the composition of a patient's initial treatment and increase the likelihood of starting appropriate treatment early. The likely benefits of rapid DST include increased cure rates, decreased mortality, reduced development of additional drug resistance, and a reduced likelihood of failure and relapse *(20)*.

In designing a treatment regimen, the following groups of medicines might be used:
- first-line anti-TB drugs;
- second-line parenteral agent (injectable anti-TB drugs): kanamycin, amikacin, capreomycin;
- fluoroquinolones: levofloxacin, moxifloxacin, gatifloxacin, ofloxacin;
- oral bacteriostatic second-line anti-TB drugs: ethionamide, prothionamide, cycloserine, terizidone, p-aminosalicylic acid;
- group 5 drugs: clofazimine, linezolid, amoxicillin/clavulanate, thioacetazone, clarithromycin, imipenem.

According to WHO's latest recommendations *(20)* for the treatment of patients with MDR-TB:
- a fluoroquinolone should be used;
- a later-generation fluoroquinolone rather than an earlier-generation fluoroquinolone should be used;
- ethionamide (or prothionamide) should be used;
- four second-line anti-TB drugs likely to be effective (including a parenteral agent), as well as pyrazinamide, should be included in the intensive phase;
- regimens should include at least pyrazinamide, a fluoroquinolone, a parenteral agent, ethionamide (or prothionamide), and either cycloserine or p-aminosalicylic acid if cycloserine cannot be used.

Compared to WHO's previous recommendations, the last version emphasized the following principles of treatment:
- include at least four second-line anti-TB drugs likely to be effective as well as pyrazinamide during the intensive phase of treatment;
- if no evidence is found to support the use of more than four second-line anti-TB drugs in patients with extensive disease, it is permissible to increase the number of second-line drugs in a regimen if the effectiveness of some of the drugs is uncertain;
- ethambutol may be used but is not included among the drugs making up the standard regimen;
- group 5 drugs may be used but are not included among the drugs making up the standard regimen.

The analysis *(20)* provided evidence of an association between the success of treatment and the total length of treatment and the length of the intensive phase. In the treatment of patients with MDR-TB (who had not previously received MDR-TB treatment), it is recommended that there should be an intensive phase of at least 8 months' duration and total treatment duration of at least 20 months.

Three options or types of treatment scheme are recommended by WHO:
(i) *standardized treatment*: all patients receive the same treatment regimen;
(ii) *standardized treatment followed by individualized treatment:* initially all patients receive the same regimen based on DST survey data for certain groups, and later the regimen is adjusted based on DST results;
(iii) *empirical treatment followed by individualized treatment:* each regimen is individually designed on the basis of the patient's history and then adjusted when DST results become available.

These schemes use information obtained from DST results and drug-resistance surveillance within the local population. The latter can also be obtained from drug-resistance surveys.

Despite good progress in several countries, the prison system is not fully included in the TB control network. There are still wide differences in policy and administration, including financial capacity, between ministries of health and prison health authorities in many countries, leading to unequal health care services.

The Consolidated Action Plan to Prevent and Combat Multidrug and Extensively Drug-Resistant Tuberculosis in the WHO European Region 2011–2015 has six strategic directions and seven areas of intervention *(19)*. In view of the high prevalence of M/XDR-TB in prison settings, prison health systems should follow all the steps defined for the civilian sector, as only very close integration between civilian and prison health systems guarantees success countrywide. The Plan includes the following special action to be taken in prison settings:

> 7.2 Strengthen MDR-TB control in prisons
>
> Activity 7.2.1 The Regional Office, using the successful model of its Health in Prison Project, will assist Member States in continuously improving TB control in penitentiary services.
>
> Activity 7.2.2 Member States will ensure that early diagnosis and effective treatment of M/XDR-TB are available in all penitentiary services across the Region by the first quarter of 2013.
>
> Activity 7.2.3 Member States will establish mechanisms for the continuum of care for released prisoners receiving TB treatment by the end of 2012.

TB/HIV co-infection

HIV is the strongest risk factor for developing TB disease in those with latent or new *M. tuberculosis* infection. The risk of developing TB is between 20 and 37 times greater in people living with HIV than among those who do not have HIV infection. TB is responsible for more than a quarter of deaths among people living with HIV. In response to the dual epidemics of HIV and TB, WHO has recommended 12 collaborative TB/HIV activities as part of core HIV and TB prevention, care and treatment services *(21)*.

Collaborative TB/HIV activities by NTPs and national HIV/AIDS programmes should prioritize prisons, where the prevalence of both diseases is higher. The goal of these activities in prisons, as in any community, is to decrease the burden of TB and HIV. The specific objectives of the collaborative activities are threefold:

- to establish a mechanism for collaboration between both programmes;
- to decrease the burden of TB in people living with HIV/AIDS;
- to decrease the burden of HIV in TB patients.

There should be an adequate mechanism for collaboration between TB and HIV/AIDS programmes at the local level and district public health services, and both should include prisons in their workplans. All activities implemented in the community should also be made available for prisoners. Collaborative activities include surveillance of HIV among TB patients, joint planning and mobilization for TB/HIV and capacity-building for TB/HIV.

It is recommended that provider-initiated voluntary HIV testing and counselling of TB patients be implemented *(22)*.

TB and HIV/AIDS programmes should coordinate TB/HIV plans, and communicate and coordinate activities in prisons to prevent duplication of work. The roles and responsibilities of each programme and of the prison staff need to be clearly defined, understood and monitored.

Capacity-building for public health and prison personnel is crucial for delivering good quality and effective TB/HIV interventions in prisons. The prison setting offers the advantage that the same health staff carry out all health-related activities and programmes; thus, a one-stop approach can be implemented for TB/HIV activities. It is very important to involve different types of group, nongovernmental organization and religious community in educating and counselling suspected cases of TB.

Decreasing the burden of TB in people living with HIV is referred to as the three I's: intensified TB case-finding, isoniazid preventive therapy (IPT) for HIV-infected people and infection control.

In prisons, all individuals living with HIV should be screened for TB either at the time of HIV diagnosis or before starting ART, when TB is most likely to be detected. In addition, intensified TB case-finding should be carried out regularly thereafter (for example, every six months), and can be done with the aid of a simple questionnaire, often the same form used during entry screening of prisoners *(23)*. Intensified TB case-finding among HIV-infected individuals prevents transmission and mortality, reduces the risk of nosocomial transmission and offers an opportunity for delivering IPT *(24)*.

The latest WHO recommendations *(24)* regarding intensified TB case-finding and IPT issued in 2011 are the following.

Adults and adolescents living with HIV should be screened for TB with a clinical algorithm. Those who do not report any one of the symptoms of current cough, fever, weight loss or night sweats are unlikely to have active TB and should be offered IPT.

Adults and adolescents living with HIV who have an unknown or positive tuberculin skin test status and are unlikely to have active TB should receive at least six months of IPT as part of a comprehensive package of HIV care. IPT should be given to such individuals irrespective of the degree of immunosuppression, and also to those on ART, those who have previously been treated for TB and pregnant women (WHO also advises 36 months duration taking into account the local epidemiology of TB and HIV in settings with a high prevalence of TB in people living with HIV).

Tuberculin skin test is not a requirement for initiating IPT in people living with HIV. People living with HIV who have a positive tuberculin skin test do, however, benefit more from IPT.

The provision of IPT to people living with HIV does not increase the risk of developing isoniazid-resistant TB. Concerns regarding the development of isoniazid resistance should not, therefore, be a barrier to providing IPT.

Decreasing the burden of HIV in TB patients includes the following activities: HIV counselling and testing of prisoners with TB, prevention of HIV transmission in prisons, co-trimoxazole preventive therapy and effective HIV treatment, care and support.

Prison health care workers should offer HIV counselling and voluntary testing to prisoners, especially TB patients, for several reasons: prisoners may want to know their HIV status; access to ART is increasingly available in many countries, including in prison populations; better diagnosis and management of other HIV-related illnesses can be achieved when the HIV status is known because some anti-TB medicines are more suitable for HIV-positive individuals; a better selection of medicines is possible when the HIV status is clear; and prisoners can be given health education to reduce high-risk activities and avoid further HIV transmission. Counselling must be confidential and done before and after the HIV testing. WHO recommends provider-initiated HIV testing and counselling.

Preventing HIV transmission can contribute to the prevention of TB. The behaviour mainly responsible for HIV transmission in prisons is injecting drug use, unprotected sex between men, and piercing and tattooing with unhygienic tools. TB and HIV/AIDS programmes should collaborate to implement comprehensive HIV strategies that target sexual, parenteral and vertical transmission of HIV. Measures to reduce the sexual spread of HIV include promoting safer sexual behaviour and practices. The provision of condoms and the prevention of rape, sexual violence and coercion are recommended. Measures for decreasing parenteral HIV transmission include ensuring the use of sterilized injections and surgical equipment in prison clinics. WHO and UNODC recommend that harm reduction programmes, syringe and needle exchanges, substitution therapy and education for prisoners about HIV and drug-injecting should be introduced in settings with a high HIV prevalence among injection drug users *(22)*.

Co-trimoxazole preventive therapy reduces mortality among smear-positive TB patients who are HIV-positive. It also reduces hospitalization and morbidity among persons living with HIV/AIDS. For TB patients, co-trimoxazole prophylaxis should be initiated irrespective of the CD4 cell count.

Effective HIV treatment includes access to ART as part of comprehensive HIV/AIDS care. ART is recommended for all patients with HIV and drug-resistant TB requiring second-line anti-TB drugs, irrespective of CD4 cell count, as early as possible (ideally as early as two weeks, and no later than eight weeks) following initiation of anti-TB treatment *(21)*.

The pooled individual patient data from longitudinal cohort studies showed a lower risk of death and a higher likelihood of cure and resolution of TB signs and symptoms in patients using ART compared with those not using ART *(25)*. The strong recommendation for use of ART is based in part on indirect evidence from its use in any patient with active TB, which shows considerable beneficial effects and a very high mortality when ART is not employed, particularly in highly immune-compromised patients (CD4 cell count <50 cells/mm^3). In the absence of other data specific to patients with drug-resistant TB receiving second-line anti-TB medication, the decision on when to start ART should be no different from the approach to the HIV-positive drug-susceptible TB patient *(25)*.

The successful implementation of this recommendation will depend on the availability of more providers trained specifically in the care of HIV, TB and drug-resistant TB and drug–drug interactions. A substantial increase in the availability of treatment and patients' access to it will probably be needed together with additional support for ensuring adherence. The need for increased integration of HIV and TB care for effective patient management, prompt evaluation of adverse events and case-holding throughout treatment will require more resources.

In 2011, WHO issued recommendations and a plan of action for improving TB/HIV collaborative mechanisms in the Region *(20,26*). All these recommendations apply to both civilian and prison populations, and include the following action:

- the Regional Office will document best practices and experiences in effective integration and service delivery models for TB/HIV/drug dependence services;
- the Regional Office and other partners will support training and education for HIV and TB health care professionals on a regular basis;
- the Regional Office and other partners will support the revision of national TB/HIV policies;
- Member States will establish a functional TB/HIV coordinating mechanism to facilitate the delivery of integrated TB and HIV (and drug use/narcology) services within the same facilities, including in prisons;
- Member States will develop directives to deliver ART in TB dispensaries and TB treatment in AIDS dispensaries (or relevant/appropriate facilities), where these are lacking;
- all authorities under the ministries of health and justice in Member States will expand access to evidence-based harm reduction services, including TB and HIV prevention, diagnosis and treatment services for people living with or at risk of HIV, in particular people who use or inject drugs;
- Member States will scale up the provision of TB prophylactic treatment in all AIDS dispensaries as a core HIV care intervention in line with internationally recommended evidence-based policies;
- ministries of health will ensure the availability of isoniazid in AIDS dispensaries as part of HIV care intervention;
- national TB and HIV programmes and dispensaries will actively engage with civil society partners to improve access to integrated TB/HIV and, where appropriate, harm reduction services for the most at-risk and vulnerable populations.

TB infection control

TB infection control is a combination of measures aimed at minimizing the risk of TB transmission. The basis of such infection control is early and rapid identification of individuals with suspected and known TB and effective treatment of disease. TB infection control, as a component of WHO's revised Stop TB Strategy *(6)*, is intended to strengthen health systems.

Policy and service delivery areas related to TB infection control *(27)* may be studied at four levels:

- managerial (organizational) control measures, including the development of TB infection control policy, strategic planning, advocacy, human resource development, monitoring and evaluation, operational research;
- administrative control measures, including early TB case detection, TB screening, separation or isolation of patients, cough etiquette and hygiene;
- environmental control measures, including natural and mechanical ventilation, ultraviolet germicidal irradiation;
- personal protection control measures, including respirators and respiratory fit testing.

Several infection control measures could be conducted in prisons *(10)*:

- preventing the spread of infection from community to prison by using intensified TB screening for new or transferred prisoners and preparing special quarantine blocks or cells (to be used for one or two weeks) for new or transferred prisoners;
- preventing the transmission of TB infection from one prisoner to other prisoners or to prison staff by: (i) conducting contact investigations for TB suspects and cases; (ii) improving infection control by carrying out organizational, administrative and environmental interventions in prisons; and (iii) using information, education and communication for prisoners;
- preventing the infection of family members and the community by released prisoners or prison staff by examining prisoners before release and examining prison staff regularly;
- establishing TB infection control in the community by instituting early TB case detection and using effective treatment.

Managerial activities in prisons

The full set of national managerial activities designed for the civilian sector should also apply to congregate settings. As a first step, policy-makers responsible for prison settings should be made part of the coordinating system for planning and implementing interventions to control TB infection. In particular, the medical service of the ministry of justice and correctional facilities should be fully engaged and encouraged to implement TB infection control. Overcrowding should be avoided in prisons because it can lead to non-infected individuals being exposed to TB. Prisons should be part of the country's surveillance activities and should be included in assessment of facilities for TB infection control. Such assessment will be useful in determining the level of risk of the facility or building. Any advocacy and information, education and communication material should include a specific focus on prisons, as should monitoring and evaluation activities. There is a great need for more research on TB infection control in prisons.

Facility-level managerial activities should also apply (with some adaptation) to prisons. Ideally, each prison should have a written TB infection control plan with a protocol for the prompt recognition, separation and provision of services for and investigation of TB, and referral of patients with suspected or confirmed TB disease. A designated infection control officer is responsible for overseeing the implementation of infection control measures and providing infection control training for health care and other staff members who may be exposed to TB infection.

Monitoring and evaluation provide the means to assess the quality, effectiveness, coverage and delivery of infection control interventions and to ensure that there is continuous improvement in the carrying out of programmes. Monitoring and evaluation should involve collaboration and sharing of indicators between programmes (for example, programmes related to TB, HIV, occupational health and infection control) and should include links between prison and civilian health services, particularly regarding the continuum of care and follow-up of released prisoners with TB.

Administrative measures

The implementation of administrative interventions in particular work practices has the highest possible impact on preventing TB transmission and is usually the least expensive measure and is, therefore, strongly advocated in most settings. To decrease TB transmission in prisons, cough etiquette and respiratory hygiene and early identification, followed by separation and proper treatment of infectious cases, should be implemented. In particular, all inmates in long-term stay facilities and inhabitants of other congregate settings should be screened for TB on entry. People suspected of having TB should be diagnosed as quickly as possible. Those patients should always be separated and, if possible, isolated in an adequately ventilated area until sputum-smear conversion. In short-stay congregate settings, such as jails and shelters, a referral system for proper case management should be established.

In prisons with a high prevalence of HIV, patients living with HIV and other forms of immune suppression should be separated from those with suspected or confirmed infectious TB. All staff and persons residing in the setting should be given information and encouraged to undergo HIV testing and counselling. If diagnosed with HIV, they should be offered a package of prevention and care that includes regular screening for active TB. Additional measures for groups at high risk (such as injecting and other drug users) should be ensured. In prisons with patients having, or suspected of having, drug-resistant TB, such patients should be separated from other patients (including other TB patients) and referral for proper treatment established.

Environmental controls

Buildings in congregate settings should comply with national norms and regulations for ventilation in public buildings and specific norms and regulations for prisons, where these exist. It is recommended that the air change rate should be no less than 6–12. Ideally, cells and wards in prison hospitals should have large windows which should be kept open often. When other environmental control measures are not in place, the emphasis should be on natural ventilation by maximizing the opening of windows.

Well-designed, well-maintained and correctly operated exhaust fans (mixed-mode ventilation) can help to obtain adequate ventilation when sufficient air change per hour cannot be achieved by natural ventilation alone.

In prisons in which there is a high risk of TB transmission and where adequate ventilation cannot be achieved (for example, because of design constraints or cold winters), another option is the use of an upper room or shielded ultraviolet germicidal irradiation device. If such a device is used, fixtures should be designed to prevent injury from improper use or tampering with the device.

Personal protective equipment in congregate settings

In addition to carrying out administrative and environmental controls, health-care workers may use respirators when caring for patients with infectious TB. Respirators (N95 or filter face-piece 2 equivalent or higher) provide reasonably good protection against TB by filtering out microscopic droplets and aerosols. The use of respirators provides protection for health-care workers in close contact with TB patients. This protection is particularly important when health staff are supervising a cough-inducing procedure (such as bronchoscopy) or sputum collection. Prisoners who are TB patients should use surgical masks when moving around inside the hospital.

Advocacy, communication and social mobilization

Advocacy, communication and social mobilization constitute the important component of the Stop TB Strategy. Although such initiatives are mainly aimed at the general population, their importance and applicability in prisons cannot be underestimated. At the institutional level, prison health authorities should address the following key strategies: improving TB case detection and compliance with treatment, combating stigma and discrimination, empowering people affected with TB and

mobilizing political commitment and resources to fight TB.

Usually, patients must present themselves to the prison health services when TB symptoms emerge (mainly in institutions where no active case-finding is in place) and adhere to treatment for at least six months. As this approach (passive case-finding) relies on prisoners' awareness of TB symptoms, delays in diagnosis and the start of treatment are common in many settings. Studies document that in prisons where educational sessions are carried out (including talks, videos, flipcharts, other educational materials, contests, question-and-answer games), adherence to treatment improves and the cure rate rises. Good results have also been also achieved by involving peer educators (prisoners) *(28)*.

Educational campaigns in prisons should be directed against stigmatization and discrimination, which are the greatest threats to TB programmes in both civilian and prison populations, and involve the prison administration as well as detainees.

In the fight against TB and HIV, it is highly recommended that the prisoners should be involved in the development and dissemination of educational programmes. Prisoners might be engaged as peer educators and treatment supporters and can play a crucial role in identifying TB suspects. During the educational campaigns everybody should be involved in designing and developing the activities: prison administration, health staff and prisoners. This kind of collaboration makes the information more sensitive and appropriate to the prison context, increases the sense of ownership among prisoners and contributes to the continuity of the programme.

A complementary political commitment lies at the core of efforts to establish and sustain effective TB control strategies in prisons. The common denominator of successful initiatives is the equal participation of decision-makers, administrators and those responsible for implementation in the public health and prison systems. Policies that support ongoing and sustainable programmes should be introduced, together with adequate resources to build the capacity to translate such policies into effective practice.

There must be political commitment at the various levels of the NTP and of the prison system. In the public health sector, the decentralization that has occurred in many resource-constrained countries has shifted the planning and resource allocation processes from the central level to provincial and district authorities, limiting in many instances the influence and involvement of the central level. Thus, strong advocacy and the continuous fostering of awareness are essential for TB services in prisons on the periphery, and decision-makers at these levels should become stakeholders in the programme to help ensure its continuity

In the Roadmap to prevent and combat drug-resistant tuberculosis (19), WHO addressed the challenges to the implementation of advocacy, communication and social mobilization activities in both the civilian and prison sectors and developed a package of recommendations, including the following:

- use the successful model of the HIPP to assist NTPs in improving TB activities in the prison system;
- facilitate the adaptation and development of advocacy, communication and social mobilization materials appropriate to the country (and prison setting);
- use all forms of the media to inform, persuade and generate action among the whole population or targeted subpopulations (prisoners) about TB, and to generate awareness of the challenge of M/XDR-TB and thus the importance of prevention, increased and speedy detection and completion of treatment;
- train (prison) health care staff in patient-centred care and intrapersonal communication skills on a regular basis to enable them to develop appropriate consultation skills and supportive attitudes.

Continuum of care for released prisoners

Following release, prisoners face problems with housing, unemployment, registration of residence, social stigma, negligence and a cautious attitude by civil society. Since released prisoners often give priority to these competing issues over their health, they need to be followed by the local health centre, NTP or organization collaborating with the NTP. This follow-up often does not happen: in eastern European countries, reportedly around 60–70% of prisoners do not refer to TB facilities after release. To minimize the interruption of treatment in released prisoners, it is recommended that discharge or referral planning, post-release follow-up, notification of unplanned releases and monitoring of referrals should be implemented *(10)*.

Discharge or referral planning

Prison health staff, as case managers, should coordinate the follow-up of released prisoners with the civilian sector (district TB coordinators) regarding where prisoners live after release, any available social support and post-release assistance (with factors such as housing, employment, continuation of treatment and psychological support). An important factor is the education of family members about the importance of the prisoner adhering to treatment and the consequences of interruption. In this

regard, peer educators play a significant role in educating prisoners. While in treatment, prisoners with TB should supply the addresses and telephone numbers of relatives and family members and information about where they plan to live.

Post-release follow-up

The following activities can contribute to an easy transition. Prison health staff should complete a referral form (part of the NTP's information system forms) for the prisoner to give to the local health centre staff where he/she will continue treatment in the community. A copy should be kept in the prison and a second copy sent to the regional area or district NTP manager. The same procedure applies to prisoners who are transferred to another prison; wherever possible, the prisoner should be introduced (preferably face to face) to the TB programme manager or district TB programme supervisor who is responsible for treatment and care in the community (local health centre staff and district NTP). Post-release appointments should be made at the local TB facility, and the prisoner supplied on release with adequate TB drugs to last until the next medical appointment.

Depending on local resources and capacity, prison and NTP local staff can work with advocacy groups or private or government-funded programmes to facilitate a safe, supported transition for prisoners into the community. Substance use, mental health conditions and poverty affect health care. The greatest barriers to continuity of care for TB lie with adherence to medication, housing, social relationships and unemployment. Nongovernmental organizations and churches working in prisons can play crucial roles in helping to follow up prisoners undergoing TB treatment after their release from prison. It is essential to establish partnerships with them that include well-defined tasks and responsibilities, and they should be sought out and included in planning and monitoring activities.

Notification of unplanned releases and unplanned transfers

Unplanned releases (amnesty, etc.) often create problems with the continuity of treatment. The prison administration should inform the health staff about all scheduled and unscheduled releases as soon as information becomes available. Prompt remedial steps need to be taken in collaboration with the local NTP supervisors to guarantee that the released TB patients visit the local health centre and continue therapy there. For this notification, prompt communication via telephone, text messages and other rapid methods are encouraged. The patient's treatment card (or a copy of it) must be sent to the receiving health care facility that will follow up the patient.

A referral register is useful for monitoring and evaluating referral and should include feedback. Registers are kept in prisons or by district NTP supervisors or both. The important indicator in monitoring released prisoners is the number of released prisoners registered in civilian TB units.

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