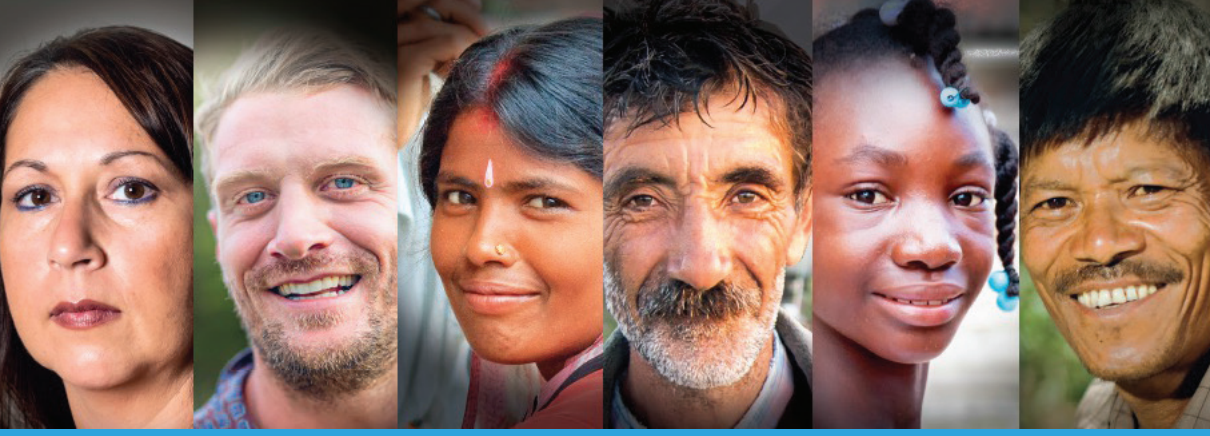

Compendium of WHO guidelines and associated standards:

ensuring optimum delivery of the cascade of care for patients with tuberculosis

THE END TB STRATEGY

World Health Organization

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Contents

Foreword

Ending the tuberculosis (TB) epidemic requires speedy adoption and implementation of the World Health Organization (WHO) End TB Strategy as the mean to reach the ambitious targets set within the Strategy and the Sustainable Development Goal framework. This requires full clarity about the best standards of prevention, diagnosis, treatment and significantly enhanced resources, both human and financial.

Beyond implementation of existing tools, an effective TB response must embrace innovation through the rapid uptake of new diagnostics, medicines, and digital platforms to modernize care provision. Working with communities, civil society and any partners, governments need to assume full responsibility for ensuring access to person-centred, modern, high-quality TB services, regardless of whether care is sought from public, voluntary, private or corporate care providers. Securing comprehensive care along with essential support for each person with TB also calls for collaboration within and beyond the health sector.

After decades of stagnation, finally new diagnostics, drugs and regimens have become available through intensified research efforts and increased field experiences. This has engendered a growing need for expert guidance to the point that the production of guidelines and policy recommendations risks resulting in limited understanding if not seen in a comprehensive and coherent fashion. This document, therefore, has been conceived to provide a general overview of all recommendations made by WHO in the past few years. It incorporates all recent policy guidance from WHO's Global TB Programme; follows the care pathway of persons with signs or symptoms of TB in seeking diagnosis, treatment and care; and it includes those cross-cutting elements that are essential to a patient-centred approach to care delivery. The document, structured in 33 WHO TB standards, is designed to consolidate all WHO TB policy recommendations into a single resource, with internet links to all additional details contained in comprehensive guidelines.

By producing the Compendium, we hope to offer a clear concise instrument that will facilitate the understanding and planning of delivery of the standards for the care of everybody affected by tuberculosis. The document will be regularly updated, including in its digital format, to allow incorporation of all new evidence that will emerge out of the development pipeline in the years to come.

Dr Mario Raviglione
Global TB Programme

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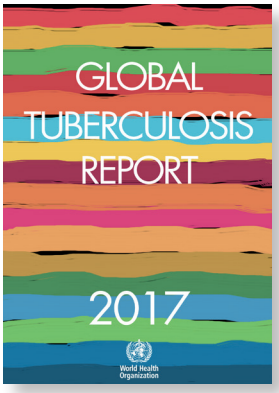
Abbreviations

aDSM	active TB drug safety monitoring and management
ART	antiretroviral therapy
BCG	bacille Calmette–Guérin
CPT	co-trimoxazole preventive therapy
CXR	chest X-ray
DOT	directly observed treatment
DST	drug-susceptibility testing
EPTB	extrapulmonary tuberculosis
FDC	fixed-dose combination
IGRA	interferon gamma release assay
LF-LAM	lateral flow urine lipoarabinomannan assay
LPA	line probe assay
LTBI	latent tuberculosis infection
MDGs	Millennium Development Goals
MDR-TB	multidrug-resistant tuberculosis
NGO	nongovernmental organization
NTP	National tuberculosis programme
RR-TB	rifampicin-resistant tuberculosis
SAT	self-administered treatment
SDGs	Sustainable Development Goals
TB	tuberculosis
TB-LAMP	loop-mediated isothermal amplification for detection of *Mycobacterium tuberculosis*
TST	tuberculin skin test
UV	ultraviolet
WHO	World Health Organization
XDR-TB	extensively drug-resistant tuberculosis

1. Introduction

The World Health Organization (WHO) estimates that 10.4 million persons developed tuberculosis (TB) worldwide in 2016, corresponding to a global incidence of 140 TB cases per 100 000 population. Of those who developed TB, 1.0 million cases (10%) occurred among persons living with HIV. The worldwide total for 2016 also included 490 000 cases of multidrug-resistant TB (MDR-TB) and 110 000 cases of rifampicin-resistant TB (RR-TB), needing the same second-line treatment regimen. In the same year, 1.67 million deaths were caused by TB, including 374 000 among persons living with HIV and nearly 240 000 among patients with MDR-TB or RR- TB.[1] These numbers make TB the top infectious killer worldwide, well above the number of deaths from HIV/AIDS or malaria, and one of the top 10 causes of deaths in 2016.



Global Tuberculosis Report 2017[1]

Since the beginning of the Millennium Development Goal (MDG) era in 2000, efforts to control TB have been intensified, with increased commitments to implementing practices aligned with WHO's recommendations. An era of increased financing followed, both domestically and internationally, through new mechanisms, notably The Global Fund to Fight AIDS, Tuberculosis and Malaria, established in 2002 and currently providing nearly 85% of international financing for TB service[2]. As a result of these efforts the MDG-related target to "have halted by 2015 and begun to reverse" TB incidence was achieved; 53 million lives were saved; and mortality was reduced by 37% since 2000. However, the annual decline in incidence rate has been only 1.4% on average worldwide, or 19% since 2000, suggesting that much more needs to be done and more resources invested to combat the disease, both in terms of implementing existing measures and performing research to develop new tools. With the end of the MDG era in 2015, it was clear that reinvigorated and intensified prevention, care and control efforts would be crucial to accelerating the decline of incidence and deaths.

Serious challenges remain in tackling the TB epidemic, among them more than 4 million missed cases (undetected or not notified), the MDR-TB crisis, a suboptimal response to the TB and HIV co-epidemics, catastrophic costs for TB patients, the slow uptake of new tools, and significant gaps in financing for research and for service delivery. These gaps culminate in patients with TB not receiving the best possible care, despite significant technological innovations introduced during the past 10 years.

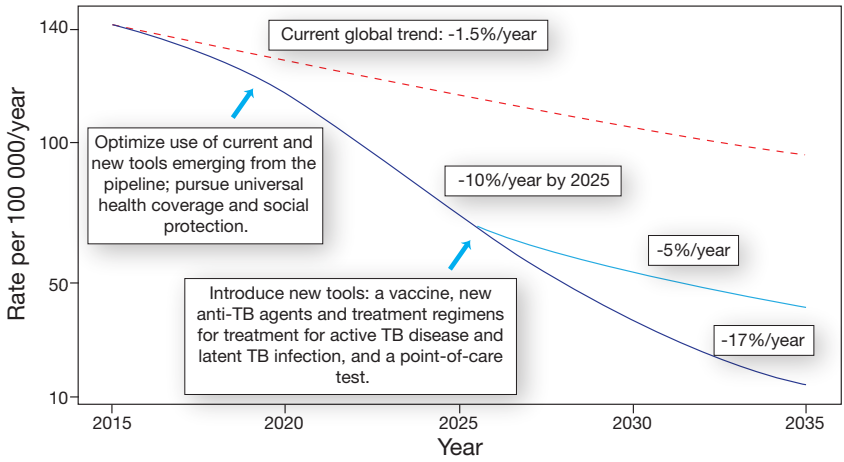
1 Global tuberculosis report 2017. Geneva: World Health Organization; 2017. (WHO/HTM/TB/2017.23; http://www.who.int/tb/publications/global_report/en/; accessed 30 October 2017).
2 Tuberculosis. In: The Global Fund [website]. Geneva: The Global Fund to Fight AIDS, Tuberculosis and Malaria; 2017 (http://www.theglobalfund.org/en/tuberculosis/, accessed 1 June 2017).

1.1 The END TB Strategy

The End TB Strategy[3]

WHO's End TB Strategy[3], developed within the context of the United Nations Sustainable Development Goals (SDGs), is a logical evolution, reflecting a paradigm shift from past global TB strategies. The original WHO DOTS strategy of 1994 created the basis for effective TB control activities by standardizing the requirements for addressing the epidemic. WHO's Stop TB Strategy of 2006 broadened this response by addressing the emerging challenges of HIV-associated TB and MDR-TB[4]. It contributed to improving access to quality TB care by engaging all public and private care providers, and civil society organizations and communities, and it encouraged investment in research to develop better tools and approaches. Ending the TB epidemic is one of the SDG targets that requires the implementation of a mix of biomedical, public health and socioeconomic interventions, often extending beyond the health sector, along with major breakthroughs in research and innovation to accelerate the decline in global TB incidence rates to reach the 2030 and 2035 targets for the End TB Strategy (Fig. 1).[3]

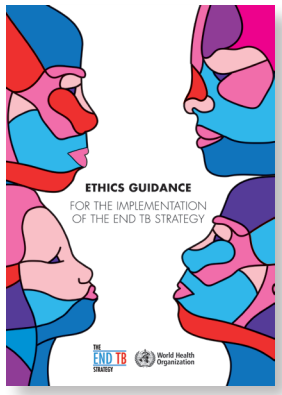
Fig. 1. Projected global trajectory of TB incidence rate 2015-2035 required to reach 2035 targets of the End TB Strategy



3 The End TB Strategy: global strategy and targets for tuberculosis prevention, care and control after 2015. Geneva: World Health Organization; 2014 (http://www.who.int/tb/strategy/End_TB_Strategy.pdf, accessed 1 June 2017).

4 The Stop TB Strategy: building on and enhancing DOTS to meet the TB-related Millennium Development Goals. Geneva: World Health Organization; 2006 (WHO/HTM/TB/2006.368; http://apps.who.int/iris/bitstream/10665/69241/1/WHO_HTM_STB_2006.368_eng.pdf, accessed 1 June 2017).

WHO's End TB Strategy was endorsed by all Member States through a resolution at the Sixty-seventh World Health Assembly in 2014. The End TB Strategy encompasses a comprehensive package of interventions based on three fundamental pillars and four underlying principles (Fig. 2). The essential components for implementing the End TB Strategy[5] (*The Essentials*) provide a framework that allows countries to adopt and to adapt their approach to ending the TB epidemic.



END TB Strategy (The Essentials)[5]

Fig. 2. WHO's End TB Strategy: three fundamental pillars and four underlying principles

1.2 Scope of the Compendium

This document focuses on the first pillar of WHO's End TB strategy – that is, activities related to integrated, patient-centred care and prevention for early detection, treatment and care of all TB patients, including children. Implementing this approach requires close collaboration among all stakeholders, including the social sector, civil society and local communities. The aim is to ensure that the patient's needs, values, preferences and rights inform the access and delivery of services.

The operational and financing approaches to enable universal access to quality care are addressed in the guidance provided in "*The Essentials"* document and other tools for national strategic planning and operational implementation.

This Compendium is organized to follow the pathway of persons with signs or symptoms of TB in seeking care and also to include cross-cutting elements essential to the patient-centred approach to care delivery that is recommended by WHO. The document also addresses TB preventive care, principally

5 Implementing The End TB Strategy: the essentials. Geneva: World Health Organization; 2015 (WHO/HTM/TB/2015.31; http://www.who.int/tb/publications/2015/end_tb_essential.pdf?ua=1 accessed 1 June 2017).

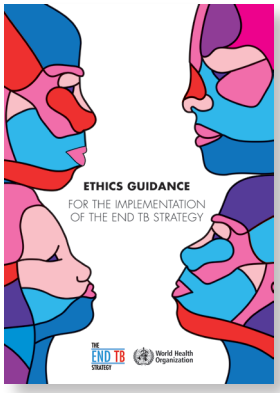
treatment for latent TB infection. It consolidates all WHO policy recommendations, and outlines WHO's standards for patient-centred care. This compilation of standards, prepared on the lines of the International Standards of TB Care[6] and enriched further with easy access to source documents, is meant to meet the needs not only of national TB programmes (NTPs) and public health physicians but also the clinicians working in the private, corporate and voluntary sectors.

1.3 Ethical Considerations

WHO's End TB Strategy and the UN SDGs, which target ending the TB epidemic by 2030, call for due attention to equity, human rights and ethics. The "protection and promotion of human rights, ethics and equity" is one of the four key principles of the Strategy.

As stated in WHO's Constitution, "the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition"[7]. Similarly, the International Covenant on Economic, Social and Cultural Rights establishes "the right of everyone to the enjoyment of the highest attainable standard of physical and mental health" (that is, the right to health), and specifically calls on states to take steps necessary for "the prevention, treatment and control of epidemic, endemic, occupational and other diseases".[8] Promoting social justice and equity in TB programmes should take into account the needs of all patients and, in particular, the special needs of socially vulnerable groups for whom tailored interventions should be proactively developed. Interventions should be gender-sensitive and address different types of vulnerabilities.

Governments and national TB programmes, with the support of the international community, have an ethical obligation to provide universal access to TB care according to international standards, including as a critical part of that care, providing quality-assured essential medicines, care and social support. WHO's ethics guidance for the implementation of the End TB Strategy presents a comprehensive review and discussion of the most relevant considerations for clinical and programmatic management of TB prevention, diagnosis, treatment and care[9].



Ethics Guidance for implementing the End TB Strategy[9]

1.4 Community Engagement

National TB programmes should systematically implement integrated, community-based TB activities by engaging communities, nongovernmental organizations (NGOs) and other civil society organizations. Community-based TB activities are wide-ranging and contribute to preventing and diagnosing TB, and improving treatment adherence and care to positively influence the outcomes of drug-sensitive, drug-resistant and HIV-associated TB.

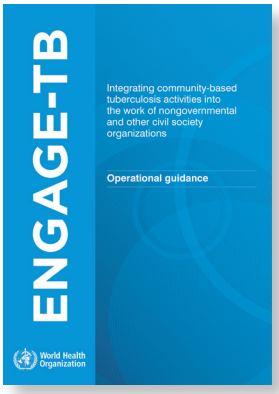
6 International Standards of Tuberculosis Care; 2014 (third edition). http://www.who.int/tb/publications/standards-tb-care-2014/en/

7 Constitution of the World Health Organization. In: Basic documents. Geneva: World Health Organization; 2006 (http://www.who.int/governance/eb/who_constitution_en.pdf, accessed 1 June 2017).

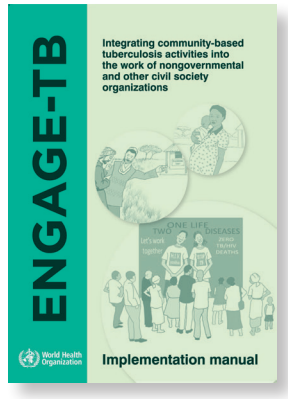
8 International Covenant on Economic, Social and Cultural Rights. Geneva: Office of the United Nations High Commissioner for Human Rights; 1966 (http://www.ohchr.org/Documents/ProfessionalInterest/cescr.pdf, accessed 1 June 2017).

9 Ethics Guidance for implementing the End TB Strategy. Geneva. World Health Organization; 2017 (WHO/HTM/TB 2017.07) http://apps.who.int/iris/bitstream/10665/254820/1/9789241512114-eng.pdf?ua=1, accessed 1 June 2017)

These activities include mobilizing communities to promote effective communication and participation among community members to generate demand for TB prevention, diagnosis, treatment and care services. Although diagnostic tests continue to be performed in clinical settings due to a lack of simple diagnostic methods, community-based TB activities are conducted outside formal health facilities (such as hospitals, health centres and clinics) and in community-based settings (such as schools, places of worship and other congregate settings) and homes. To improve synergies and the impact of such activities, community-based TB interventions should be integrated with other activities that support primary health-care services, including those targeting HIV infection, maternal and child health, and noncommunicable diseases. Community-based TB activities utilize mechanisms through which community members, community-based organizations and groups interact to coordinate and deliver their responses to the challenges and needs affecting their communities. WHO's ENGAGE-TB approach provides policy and programme guidance to promote the systematic engagement of NGOs and other civil society organizations in delivering integrated community-based TB activities.[10, 11]



Engage TB Approach – Operational Guidance[10]



Engage TB Approach – Implementation Manual[11]

1.5 Public-Private Mix to engage all care providers

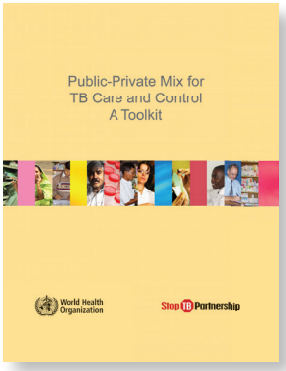
Engaging all relevant health care providers in TB care through public-private mix (PPM) approaches is an essential component of the WHO End TB Strategy. This means systematic involvement of all relevant health care providers in TB care to promote the use of International Standards for TB Care and contribute constructively to achieve national and global End TB targets. Global guidelines on various aspects of TB care are often developed for the purpose of NTPs. This compendium presents a handy guide not only for NTPs but also for public and private physicians to enable them to put evidence-based WHO policies and international standards into routine practice. PPM encompasses diverse collaborative strategies such as public-private (between NTP and the private sector), public-public (between NTP and other public sector care providers such as general hospitals, prison or military health services and social security organizations), and private-private (between an NGO or a private hospital and the neighborhood private providers) collaboration. These collaborations

10 Engage-TB: integrating community-based tuberculosis activities into the work of nongovernmental and other civil society organizations. Operational guidance. Geneva: World Health Organization; 2012 (WHO/HTM/TB/2012/8; http://apps.who.int/iris/bitstream/10665/75997/1/9789241504508_eng.pdf?ua=1, accessed 1 June 2017).

11 Engage-TB: integrating community-based tuberculosis activities into the work of nongovernmental and other civil society organizations. Implementation manual. Geneva: World Health Organization; 2013 (WHO/HTM/TB/2013.10; http://apps.who.int/iris/bitstream/10665/96900/1/9789241506540_eng.pdf?ua=1, accessed 1 June 2017).

are required because individual and institutional care providers especially in the private sector are often unable to carry out, on their own, all the clinical and public health tasks essential in the delivery of high-quality TB care. PPM also implies engaging relevant care providers in prevention and management of MDR-TB and in the implementation of TB/HIV collaborative activities.

The WHO policy and accompanying toolkit[12] on engaging all care providers in TB prevention and care provides guidance on practical steps that countries should undertake to involve various providers in efforts to combat TB. This compendium is an important addition to the PPM toolkit. There is no one-size-fits all PPM approach. It is crucial that PPM is planned based on a national situation assessment. NTPs are mandated to shoulder the stewardship role, to ensure that technical standards are met, drugs are provided free of charge to patients, and that all aspects of coordination, training, contracting, supervision and surveillance are carried out as per NTP guidelines. Suitable roles for different health care providers should be defined and enabled according to the need of the programme, and the capacity and willingness of different health care providers.

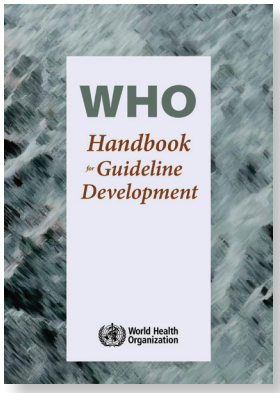


Public-Private Mix Toolkit[12]

12 Public-private mix for TB care and control: A toolkit. Geneva: World Health Organization; 2010. http://apps.who.int/iris/bitstream/10665/44450/1/9789241500487_eng.pdf?ua=1&ua=1, accessed 1 June 2017)

2. WHO's policy development process

WHO uses the GRADE (Grading of Recommendations Assessment, Development and Evaluation)[13] approach to assess the quality of a body of evidence, and to develop and report recommendations. The detailed policy recommendations referred to in this compendium of guidelines qualify their strength as well as the certainty of the evidence on which they are based. The recommendation should be read along with the accompanying remarks that summarize the evidence upon which the recommendation was made, the anticipated desirable and undesirable effects of the interventions (to assess the balance between expected benefits and risks), and other considerations that are important for the implementation of the policies. The certainty of evidence is categorized into four levels (Table 1).



WHO Handbook for Guideline Development[13]

Table 1. Certainty of evidence and definitions

Certainty of evidence	Definition
High (⊕⊕⊕⊕)	Further research is very unlikely to change our confidence in the estimate of effect.
Moderate (⊕⊕⊕)	Further research is likely to have an important impact on our confidence in the effect and may change the estimate.
Low (⊕⊕)	Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very Low (⊕)	Any estimate of effect is very uncertain.

A number of factors may increase or decrease the certainty of evidence. The highest rating is usually assigned to data from randomized controlled trials (or RCTs) while evidence from observational studies is usually assigned a low or very low quality value at the start of the process. Quality of the evidence can be down-graded or up-graded based on the specific elements of the GRADE evidence assessment process as outlined in the WHO Handbook on Guideline Development.

A recommendation may be strong or conditional. Apart from the quality of evidence, the strength of a recommendation is determined by the balance between desirable and undesirable effects, values and preferences, and considerations of equity, resource use and feasibility. For strong recommendations, the GRADE assessment shows that the desirable effects of an intervention clearly outweigh the undesirable effects and that the intervention will benefit most (if not all) public health

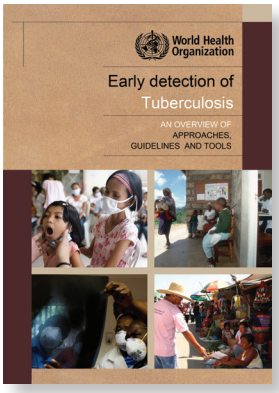
13 Handbook for Guideline Development 2nd Ed. Geneva: World Health Organization; 2014 http://www.who.int/publications/guidelines/handbook_2nd_ed.pdf?ua=1, accessed 1 June 2017

programmes and patients. The reverse may also hold, ie. that undesirable effects clearly outweigh anticipated benefits, which would lead to a strong recommendation against an intervention. For conditional recommendations, the GRADE assessment considers that desirable effects probably outweigh the undesirable effects in most settings and for most public health programmes and patients. Conditional recommendations therefore always outline the desired considerations/ conditions for implementation of the actual WHO policy guidance. The conditionality of any recommendation by WHO should therefore never be an impediment to national TB programmes to adopting and scaling-up innovations to improve TB diagnosis, treatment and care. At times a clinical question remains unanswered after review of available data; in such a situation no evidence-informed recommendation is possible. The decision to make no recommendation is different from a negative recommendation (for which there is evidence against the use of a certain intervention).

3. Early detection of TB

WHO TB Standard 1. For persons with signs or symptoms consistent with TB, performing prompt clinical evaluation is essential to ensure early and rapid diagnosis.

Health-care workers may delay or fail to undertake promptly the clinical evaluation of persons presenting with symptoms suggestive of TB. Therefore, all health-care workers in all relevant public and private health-care facilities should be sensitive to the need to identify and evaluate persons suspected of having TB, especially those with respiratory symptoms.[14] Health-care workers should also be aware of the need to pay special attention to risk groups that are common to all settings and those that are specific to the settings in which they work.

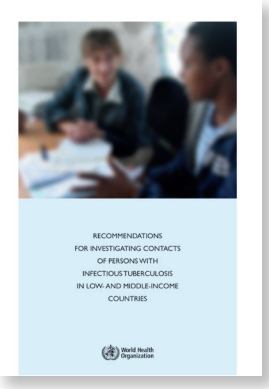


An overview of approaches guidelines and tools[14]

WHO TB Standard 2. All persons who have been in close contact with patients who have pulmonary TB should be evaluated. The highest priority contacts for evaluation are those:

– with signs or symptoms suggestive of TB;
– aged < 5 years;
– with known or suspected immuno-compromising conditions, particularly HIV infection;
– who have been in contact with patients with MDR-TB or extensively drug-resistant (XDR) TB.

Evidence indicates that in both high- and low-incidence countries, the prevalence of TB among contacts is high, particularly among household members.[15] Evidence also suggests that contact investigations could be particularly useful for identifying childhood TB. Furthermore, contact investigation can help identify persons who require careful follow up, such as those who were exposed to an index case with MDR- or XDR- TB and persons infected with HIV or who have other factors that put them at risk for rapid progression to active TB. Effective investigation of TB contacts within national TB programmes and other services can result in the detection of a significant number of cases. Early identification means a better chance of cure and, potentially, a reduction in further transmission. Furthermore, contact investigation allows for the identification of persons who have latent infection and are at a high risk for active TB, so they can receive preventive treatment.



Investigating contacts of persons with infectious tuberculosis[15]

14 Early detection of tuberculosis: An overview of approaches, guidelines and tools. Geneva: World Health Organization (WHO/HTM/STB/PSI/2011.21 http://apps.who.int/iis/bitstream/10665/70824/1/WHO_HTM_STB_PSI_2011.21_eng.pdf?ua=1, accessed 1 June 2017)

15 Recommendations for investigating contacts of persons with infectious tuberculosis in low- and middle-income countries. Geneva: World Health Organization (WHO/HTM/TB/2012.9 http://apps.who.int/iris/bitstream/10665/77741/1/9789241504492_eng.pdf?ua=1, accessed 1 June 2017)

WHO TB Standard 3. All persons living with HIV and workers who are exposed to silica should always be screened for active TB in all settings. Other high risk groups should be prioritized for screening based on the local TB epidemiology, health system capacity, resource availability and feasibility of reaching the risk groups.

Indiscriminate mass screening should be avoided while risk groups should be prioritized for screening based on careful assessment of local TB epidemiology, potential benefits and risks of harm of screening, and alternative interventions to improve early TB detection[16, 17]. People with very high risk of TB or severe consequences of delayed TB diagnosis should be prioritized first:

• persons in prisons and other penal institutions, and prison staff;

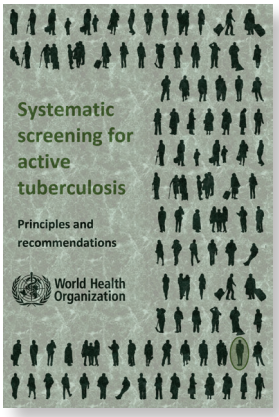
• persons with an untreated fibrotic lesion on chest X-ray (CXR);

• persons in settings where there is a high burden of TB (an estimated prevalence >100/100 000 in the general population) who are seeking care or who are in care and belong to selected risk groups), and health-care workers in these settings;

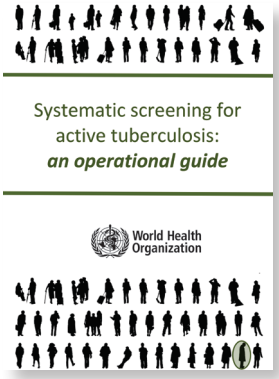
• geographically defined subpopulations with extremely high levels of undetected TB (>1% prevalence) and other subpopulations with very poor access to health care.

Early detection of TB is essential to further improve health outcomes for people with TB, and to reduce TB transmission more effectively. Systematic screening in high risk groups is a possible complement to efforts to improve the patient-initiated pathway to TB diagnosis.

The available evidence suggest that screening, if done in the right way and targeting the right people, may reduce suffering and death. There is a need to balance potential benefits against the risks and costs of screening. Some risk groups should always be screened, whereas the prioritization of other risk groups as well as the choice of screening approach depend on the epidemiology, the health-system context, and the resources available.



Systematic screening for active tuberculosis. Principles and recommendations[16]



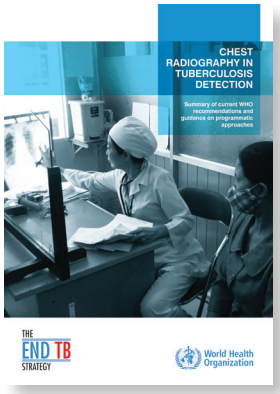
Systematic screening for active tuberculosis: An operational guide[17]

16 Systematic screening for active tuberculosis. Principles and recommendations. Geneva: World Health Organization, 2013. (WHO/HTM/TB/2013.04. http://apps.who.int/iris/bitstream/10665/84971/1/9789241548601_eng.pdf?ua=1&ua=1, accessed 1 June 2017).

17 Systematic screening for active tuberculosis: an operational guide. Geneva: World Health Organization, 2015. (WHO/HTM/TB/2015.16 http://apps.who.int/iris/bitstream/10665/181164/1/9789241549172_eng.pdf?ua=1&ua=1, accessed 1 June 2017).

WHO TB Standard 4. Chest radiography, or CXR, is an important tool for triaging and screening for pulmonary TB, and it is also useful to aid diagnosis when pulmonary TB cannot be confirmed bacteriologically. CXR can be used to select individuals for referral for bacteriological confirmation, and the role of radiology remains important when bacteriological tests cannot provide a clear answer.

Access to high-quality radiography is limited in many settings. Ensuring the wider and quality-assured use of CXR for TB detection in combination with the laboratory-based diagnostic tests recommended by WHO, can contribute to earlier TB diagnosis and, potentially, to closing the TB case-detection gap when CXR is used in algorithms as part of a framework of health-system and laboratory strengthening.[18]



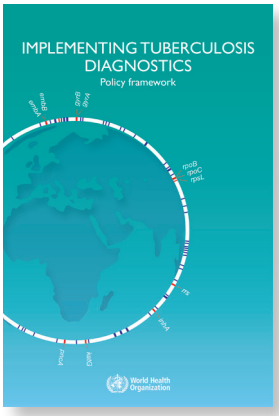
Chest Radiography in Tuberculosis Detection[18]

18 Chest radiography in tuberculosis detection. Summary of current WHO recommendations and guidance on programmatic approaches. Geneva: World Health Organization, 2016(WHO/HTM/TB/2016.20 http://apps.who.int/iris/bitstream/10665/252424/1/9789241511506-eng.pdf?ua=1, accessed 1 June 2017).

4. Diagnosing TB disease

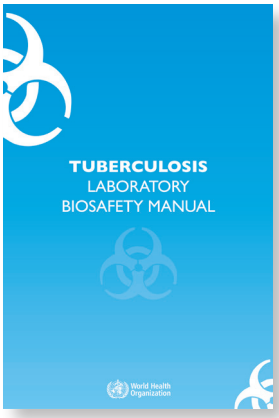
WHO TB Standard 5. To safely and efficiently diagnose TB and drug-resistant TB requires a functional network of quality assured laboratories with appropriate biosafety measures in place for performing different technical procedures. As such, TB programmes require a tiered network of integrated laboratories in which different levels use complementary tools to diagnose TB and HIV, and have mechanisms for referring specimens between the different levels of the network.

A policy framework for implementing tuberculosis diagnostics presents a structure for introducing WHO's recommended diagnostic techniques for TB.[19] It is expected that countries will adapt this generic policy framework within the contexts of their own epidemiological situation and resources. No single policy framework can address all issues in detail due to the diversity of resources and needs in different countries, as well as the geographical variation in the epidemiology of TB, HIV-associated TB and drug-resistant TB. Sputum smear microscopy remains the primary diagnostic technique in many high TB burden settings. Performing microscopy on two sputum specimens from persons provided with instruction on how to produce a good quality sputum specimen collected at any time of the day (spot specimen) yields equivalent results as microscopy on specimens collected from patients in the early morning. Sputum-smear microscopy is a relatively insensitive test. The sensitivity is further reduced in patients with extrapulmonary TB, children and in those who are co-infected with HIV. Microscopy for acid-fast bacilli cannot distinguish MTB from nontuberculous mycobacteria; it cannot distinguish viable from nonviable organisms; and it cannot distinguish drug-susceptible strains from drug-resistant strains. TB programmes should transition to replacing microscopy as the initial diagnostic test with WHO-recommended rapid diagnostics that allow for the simultaneous detection of TB and drug-resistant TB.



Policy framework for implementing TB diagnostics[19]

WHO's *Tuberculosis laboratory biosafety manual* uses an approach based on risk assessment that promotes the development of appropriate biosafety practices in laboratories and takes into account the combination of test procedures, staff expertise and facilities present in each laboratory.[20]



Tuberculosis laboratory biosafety manual.[20]

19 Implementing tuberculosis diagnostics: policy framework. Geneva: World Health Organization; 2015 (WHO/HTM/TB/2015.11; http://apps.who.int/iris/bitstream/10665/162712/1/9789241508612_eng.pdf?ua=1&ua=1, accessed 1 June 2017).

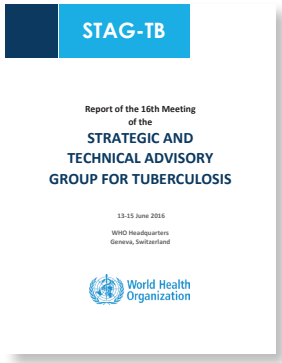
20 Tuberculosis laboratory biosafety manual. Geneva: World Health Organization; 2012 (WHO/HTM/TB/2012.11; http://apps.who.int/iris/bitstream/10665/77949/1/9789241504638_eng.pdf, accessed 1 June 2017).

WHO TB Standard 6. All patients with signs and symptoms of pulmonary TB who are capable of producing sputum should have as their initial diagnostic test at least one sputum specimen submitted for Xpert MTB/RIF Ultra assay. This includes children who are able to provide a sputum sample and patients with extrapulmonary TB (EPTB). A second Xpert MTB/RIF Ultra assay may be performed for all patients who initially test negative by Xpert MTB/RIF Ultra but whose signs and symptoms of TB persist.

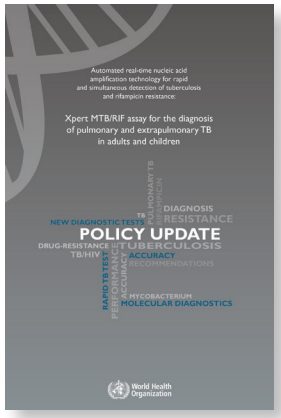
The End TB Strategy calls for early diagnosis and prompt treatment for persons of all ages who have any form of TB. This requires ensuring access to WHO-recommended rapid diagnostics and universal access to drug-susceptibility testing (DST) for all patients with signs and symptoms of TB. WHO defines universal access to DST as rapid DST for at least rifampicin among all patients with bacteriologically confirmed TB, and further DST for at least fluoroquinolones and second-line injectable agents among all TB patients with rifampicin resistance.[21]

The sensitivity of the Xpert MTB/RIF assay (Cepheid, Sunnyvale, CA, United States) for detecting TB is similar to that of solid culture (88% when compared with liquid culture as a reference standard); the specificity is also high (99%).

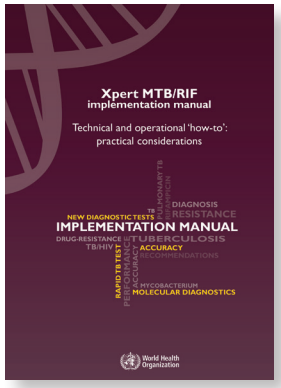
The Xpert MTB/RIF assay is the only WHO-recommended diagnostic test that simultaneously detects TB and rifampicin resistance, and it is suitable for use at lower levels of the health system. The Xpert MTB/RIF assay has 95% sensitivity and 98% specificity for detecting rifampicin resistance when compared with phenotypic reference standards.[22, 23]



Report of the 16th meeting of the Strategic and Technical Advisory Group for Tuberculosis[21]



Xpert MTB/RIF assay: Policy update[22]



Xpert MTB/RIF assay: Implementation manual [23]

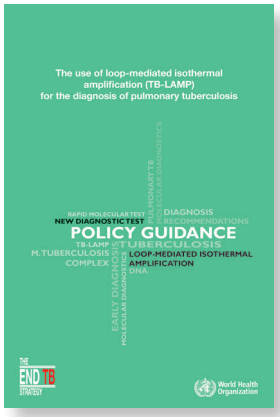
21 Report of the 16th meeting of the Strategic and Technical Advisory Group for Tuberculosis. Geneva: World Health Organization; 2016 (WHO/HTM/TB/2016.10; http://www.who.int/tb/advisory_bodies/stag_tb_report_2016.pdf?ua=1, accessed 1 June 2017).
22 Automated real-time nucleic acid amplification technology for rapid and simultaneous detection of tuberculosis and rifampicin resistance: Xpert MTB/RIF assay for the diagnosis of pulmonary and extrapulmonary TB in adults and children. Policy update. Geneva: World Health Organization; 2013 (WHO/HTM/TB/2013.16; http://apps.who.int/iris/bitstream/10665/112472/1/9789241506335_eng.pdf, accessed 1 June 2017).
23 Xpert MTB/RIF implementation manual. Technical and operational 'how-to': practical considerations. Geneva: World Health Organization; 2014 (WHO/HTM/TB/2014.1; http://apps.who.int/iris/bitstream/10665/112469/1/9789241506700_eng.pdf?ua=1, accessed 1 June 2017).

The Xpert MTB/RIF Ultra assay has a higher sensitivity than the Xpert MTB/RIF assay, particularly in smear-negative, culture-positive specimens and in specimens from HIV-positive patients. It has at least as good accuracy for detecting rifampicin resistance. However, as a result of the increased sensitivity, the Xpert MTB/RIF Ultra assay also detects non-replicating and non-viable bacilli, particularly in patients with a recent history of TB, which reduces the overall specificity of the Xpert MTB/RIF Ultra assay in high-burden settings. Nonetheless, in low-burden settings and when testing specimens to diagnose EPTB and paediatric TB, false-positive results were not a major concern.[24]

Non-inferiority analysis of Xpert MTB/RIF Ultra compared to Xpert MTB/RIF[24]

WHO recommends using the ***Xpert MTB/RIF Ultra assay*** as the **initial diagnostic test** to detect TB and rifampicin resistance for all patients with signs and symptoms of TB. This includes children and patients (if they are able to provide a sputum sample). However, the majority of children will have negative results with all of the available bacteriological tests; therefore, a negative test result does not exclude TB in children.

Loop-mediated isothermal amplification for detecting TB (TB-LAMP), another molecular diagnostic test, may be used as a replacement test or as a follow-on test to sputum-smear microscopy for diagnosing pulmonary TB in adults with signs and symptoms consistent with TB.[25] These recommendations apply to settings where it is possible to perform conventional sputum-smear microscopy. TB-LAMP should not replace rapid molecular tests that detect TB and resistance to rifampicin, especially among populations at risk of MDR-TB.



Loop-mediated isothermal amplification for detecting TB (TB-LAMP)[25]

WHO TB Standard 7. The Xpert MTB/RIF Ultra assay should be used in preference to conventional microscopy and culture as the initial diagnostic test for cerebrospinal fluid specimens from patients being evaluated for TB meningitis. The Xpert MTB/RIF Ultra assay is recommended as a replacement test for usual practice (including conventional microscopy, culture or histopathology) for testing specific non-respiratory specimens (lymph nodes and other tissues) from patients suspected of having EPTB.

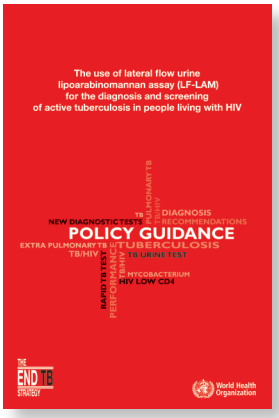
Given the urgency of rapid diagnosis when a patient is evaluated for TB meningitis, the Xpert MTB/RIF Ultra assay should be used. Pleural fluid is a suboptimal specimen for the bacterial

24 WHO meeting report of a technical expert consultation: non-inferiority analysis of Xpert MTB/RIF Ultra compared to Xpert MTB/RIF. Geneva: World Health Organization; 2017 (WHO/HTM/TB/2017.04; http://apps.who.int/iris/bitstream/10665/254792/1/WHO-HTM-TB-2017.04-eng.pdf, accessed 1 June 2017).
25 The use of loop-mediated isothermal amplification (TB-LAMP) for the diagnosis of pulmonary tuberculosis: policy guidance. Geneva: World Health Organization; 2016 (WHO/HTM/TB/2016.11; http://apps.who.int/iris/bitstream/10665/249154/1/9789241511186-eng.pdf?ua=1, accessed 1 June 2017).

confirmation of pleural TB using any method. These recommendations currently do not apply to specimens of stool, urine or blood, given the insufficient data on the utility of Xpert MTB/RIF Ultra in these specimens. Standard operating procedures for processing extrapulmonary specimens are provided in the Xpert MTB/RIF implementation manual.

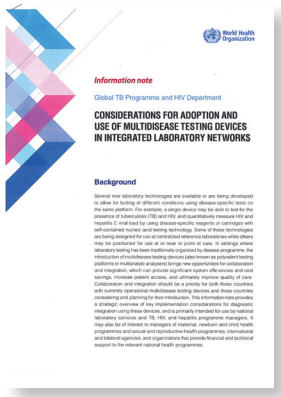
WHO TB Standard 8. For persons living with HIV, the Xpert MTB/RIF Ultra assay should be used as an initial diagnostic test. The lateral flow urine lipoarabinomannan assay (LF-LAM) can be used to assist in the diagnostic process for HIV-positive patients who are seriously ill.

LF-LAM is recommended to assist in the diagnosis of TB in HIV-positive adult inpatients with signs and symptoms of TB (pulmonary or extrapulmonary, or both) who have a CD4 cell count ≤100 cells/μL, and for HIV-positive patients who are seriously ill regardless of their CD4 count, and for those with an unknown CD4 count.[26]



Lateral flow urine lipoarabinomannan assay (LF-LAM)[26]

Several new laboratory technologies are available or being developed to allow the same platform to be used to test for multiple conditions. For example, a single device may be able to test for the presence of TB and HIV, as well as quantitatively measure the viral load of HIV and hepatitis C. Some of these technologies are designed for reference laboratories, whereas others may be used at the point of care. A number of issues should be considered before adopting devices that test for multiple diseases, including how to coordinate planning, whether the devices have regulatory approval and they have been validated in a setting similar to where they will be used, the choice of product and site where they will be placed. Details can be found in *Considerations for adoption and use of multi-disease testing devices in integrated laboratory networks*.[27]



Multi-disease testing devices in integrated laboratory networks[27]

26 The use of lateral flow urine lipoarabinomannan assay (LF-LAM) for the diagnosis and screening of active tuberculosis in people living with HIV: policy guidance. Geneva: World Health Organization; 2015 (WHO/HTM/TB/2015.25; http://apps.who.int/iris/bitstream/10665/193633/1/9789241509633_eng.pdf?ua=1&ua=1, accessed 1 June 2017).

27 Considerations for adoption and use of multi-disease testing devices in integrated laboratory networks. Geneva: World Health Organization; 2017. (WHO/HTM/TB/2017.06; http://apps.who.int/iris/bitstream/10665/255693/1/WHO-HTM-TB-2017.06-eng.pdf?ua=1, accessed 27 June 2017).

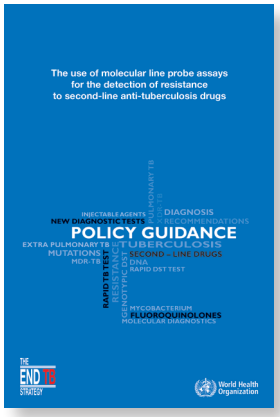
WHO TB Standard 9. DST using WHO-recommended rapid tests should be performed for all TB patients prior to starting therapy, including new patients and patients who require retreatment. If rifampicin resistance is detected, rapid molecular tests for resistance to isoniazid, fluoroquinolones and second-line injectable agents should be performed promptly to inform the treatment of MDR-TB and XDR-TB.

WHO recommends using commercially available molecular line probe assays (LPAs) as the initial test, instead of phenotypic culture-based DST, to detect resistance to rifampicin and isoniazid for persons with a sputum smear-positive specimen (direct testing) or a culture isolate of *Mycobacterium tuberculosis* complex (indirect testing). Commercially available molecular LPAs have good accuracy when used for either direct or indirect testing for resistance to rifampicin. Culture-based DST may still be necessary when an LPA does not detect isoniazid resistance.[28]

WHO recommends using molecular LPAs for second-line anti-TB agents, instead of phenotypic culture-based DST, as the initial test to detect resistance to fluoroquinolones and second-line injectable agents in patients with confirmed RR-TB or MDR-TB.[29] WHO recommends using second-line LPAs to test sputum specimens (direct testing) and culture isolates of *M. tuberculosis* complex (indirect testing) from both pulmonary and extrapulmonary sites.

Mutations conferring resistance to second-line injectable agents that are detected by second-line LPA tests are highly correlated with the results of culture-based phenotypic DST. Mutations conferring resistance to fluoroquinolones that are detected by second-line LPA are highly correlated with the results of culture-based phenotypic DST. Second-line LPA can be used to identify persons eligible for enrolment on the shorter MDR-TB regimen.

Molecular line probe assays for the detection of resistance to isoniazid and rifampicin: Policy update[28]



Molecular line probe assays for the detection of resistance to second-line anti-tuberculosis drugs: Policy guidance [29]

28 The use of molecular line probe assays for the detection of resistance to isoniazid and rifampicin: policy update. Geneva: 2016 update. Geneva: World Health Organization; 2016. (WHO/HTM/TB/2016.12; http://apps.who.int/iris/bitstream/10665/250586/1/9789241511261-eng.pdf?ua=1, accessed 1 June 2017).
29 The use of molecular line probe assays for the detection of resistance to second-line anti-tuberculosis drugs: policy guidance. Geneva: World Health Organization; 2016 (WHO/HTM/TB/2016.07; http://apps.who.int/iris/bitstream/10665/246131/1/9789241510561-eng.pdf?ua=1 , accessed 1 June 2017).

WHO TB Standard 10. Culture-based DST for selected second-line anti-TB agents should be performed for patients enrolled in individualized (longer) MDR-TB treatment.

DST serves three main purposes: first, it can be used to guide the choice of chemotherapy for a patient. Second, it is valuable in confirming that resistance has emerged when a patient has failed to have a satisfactory response to treatment. Third, it can be used for the surveillance of emerging resistance.

DST uses critical concentrations of anti-TB agents to determine the susceptibility or resistance of a culture of *M. tuberculosis*. The critical concentration of an anti-TB agent has been adopted and modified from an international standard.[30] The critical concentration is the lowest concentration of an anti-TB agent that will inhibit the growth of at least 95% of wild-type strains of *M. tuberculosis*. The critical concentration is typically the same as, or one dilution higher than, the epidemiological cut-off value in order to ensure that phenotypically wild-type strains are not misclassified as phenotypically non-wild-type.

In April 2017, a technical expert group reviewed the evidence for different critical concentrations used for DST in different culture media. The critical concentrations were subsequently revised and include critical concentrations for performing DST for the new and repurposed anti-TB agents bedaquiline, delamanid, linezolid and clofazimine. In addition, consensus was achieved for the revised critical concentrations for fluoroquinolones and second-line injectable agents. (The new recommendations for performing DST and an accompanying technical manual will be published in 2018.)

30 Technical Expert Group: critical concentrations for drug susceptibility testing for TB medicines. Meeting report. Geneva, World Health Organization, 2017. (WHO/HTM/TB/2017.22)

5. Diagnosing latent TB infection

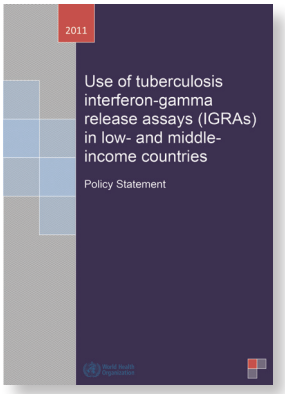
WHO TB Standard 11. Either TST or an interferon gamma release assay (IGRA) can be used to test for latent TB infection (LTBI). A tuberculin skin test (TST) is not required before initiating isoniazid preventive therapy (known as IPT) in persons living with HIV.

No tool allows direct measurement of *M. tuberculosis* infection in humans, and the diagnosis of LTBI is based on a positive result by either TST or IGRA, indicating an immune response to *M. tuberculosis*. However, these tests cannot accurately predict the risk of developing active TB disease. Furthermore, a systematic review did not show significant differences in their ability to predict the development of active TB disease.

Due to the limited performance of these tests – which could result in the under diagnosis of those at risk of developing active TB – as well as operational challenges, in resource-constrained settings with a high burden of TB an LTBI test should not be required before providing preventive treatment to persons living with HIV and children younger than 5 years who are household contacts of a person with pulmonary TB. However, given that people living with HIV who have positive TST results benefit more from preventive treatment than those with a negative TST, the test can be used where feasible.

For other at-risk populations, particularly in settings with a low burden of TB, identifying TB infection by using a test for LTBI can ensure that the benefits of LTBI treatment outweigh the harms. Either the TST or IGRA can be used to test for LTBI[31].

Given the low specificity of the IGRA and the TST, and to avoid unnecessary treatment, neither test should be used to diagnose active TB disease.



Use of tuberculosis interferon-gamma release assays (IGRAs)[31]

31 Use of tuberculosis interferon-gamma release assays (IGRAs) in low- and middle-income countries. Geneva: World Health Organization; 2011 (WHO/HTM/TB/2011.18; http://apps.who.int/iris/bitstream/10665/44759/1/9789241502672_eng.pdf?ua=1&ua=1, accessed 1 June 2017).

6. Treating TB

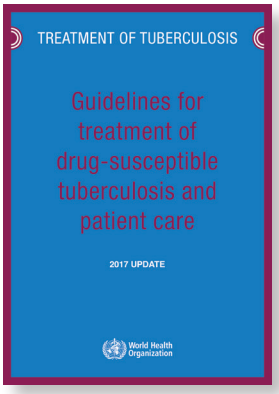
6.1 Treating drug-susceptible TB

WHO TB Standard 12. While awaiting DST results, patients with drug-susceptible TB and TB patients who have not been treated previously with anti-TB agents and do not have other risk factors for drug resistance should receive a WHO-recommended first-line treatment regimen using quality assured anti-TB agents. The initial phase should consist of 2 months of isoniazid, rifampicin, pyrazinamide and ethambutol. The continuation phase should consist of 4 months of isoniazid and rifampicin. Daily dosing should be used throughout treatment. The doses of anti-TB agents should conform to WHO's recommendations. Fixed-dose combination (FDC) anti-TB agents may provide a more convenient form of administration.

The standard 6-month regimen for drug-susceptible TB (2 months of isoniazid, rifampicin, pyrazinamide and ethambutol followed by 4 months of isoniazid and rifampicin, denoted as 2HRZE/4HR) is the recommended regimen, and it showed better outcomes than other regimens using first-line anti-TB agents for treating drug-susceptible TB[32]. Any deviation from this TB treatment recommendation should only be conducted under proper research conditions. Shorter 4-month regimens containing fluoroquinolones are associated with significantly higher rates of relapse compared with the standard 6-month rifampicin-containing regimen; therefore, these shorter regimens are not recommended.

Evidence has shown that FDCs are non-inferior and as effective as separate formulations of anti-TB agents in terms of treatment failure, death, treatment adherence and adverse events. Patients' greater satisfaction with FDC treatment is an advantage of using these formulations. FDCs may provide programme benefits by making it easier to order medication, simplifying supply chain management, reducing the occurrence of stock-outs, and facilitating the delivery of anti-TB agents and the preparation of prescriptions. FDCs may also provide other benefits, especially in settings with a large number of TB patients and a limited number of health-care workers, by reducing the need for additional health-care staff and additional training in the dosing and dispensing of medications, as well as by lowering the number of pills that patients need to take.

In patients with pulmonary TB who are being treated with a first-line regimen, sputum testing should be done by the end of months 2, 5 and 6 (at the end of treatment). If a specimen obtained at the end of month 2 is sputum smear-positive and culture positive, DST for resistance to at least rifampicin should be performed to guide the therapy. Xpert is not suitable for monitoring of patients during treatment.



Treatment of drug-susceptible tuberculosis and patient care: 2017 update[32]

32 Guidelines for treatment of drug-susceptible tuberculosis and patient care: 2017 update. Geneva: World Health Organization; 2017 (WHO/HTM/TB/2017.05; http://apps.who.int/iris/bitstream/10665/255052/1/9789241550000-eng.pdf?ua=1, accessed 1 June 2017).

WHO TB Standard 13. In patients who require retreatment for TB, the category II regimen should no longer be prescribed and DST should be conducted to inform the choice of treatment regimen.

There are several reasons why the category II regimen should no longer be used. With the advent of widespread DST, the standard of care is to perform DST on specimens from persons whose treatment has been interrupted or who have had a recurrence of disease, and then to treat them based on the drug-resistance profile. Not carrying out DST and, instead, empirically treating with the substandard category II regimen creates an inequitable treatment situation, delays proper treatment for drug-resistant TB (which fuels resistance and leads to worse outcomes not only for patients with drug-resistant TB but also for the community) and unnecessarily exposes patients with drug-susceptible disease to the toxicities of streptomycin.

One of the basic principles of TB treatment is that a single anti-TB agent should not be added to an unsuccessful regimen. Adding streptomycin to a previously unsuccessful regimen of isoniazid, rifampicin, ethambutol and pyrazinamide violates this principle and fuels the development of resistance, which will lead to the loss of streptomycin as a second-line agent for MDR-TB therapy. Patients whose first-line TB treatment has been interrupted, failed or who have had a recurrence of disease tend to have a higher risk of resistance than new TB patients. Using a category II regimen for these patients runs contrary to basic treatment principles and will accelerate the emergence of drug resistance.

WHO TB Standard 14. In patients with tuberculous meningitis or tuberculous pericarditis, adjuvant corticosteroid therapy should be used in addition to an appropriate TB treatment regimen.

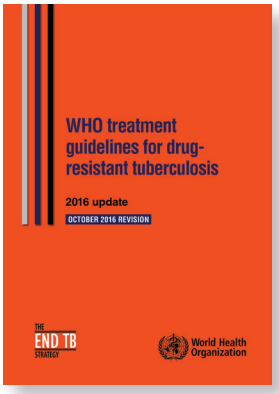
In patients with tuberculous meningitis, lower rates of mortality, death or severe disability, and disease relapse occur when patients are treated with corticosteroids in addition to their anti-TB treatment. Additionally, rates of adverse events and severe adverse events, including severe hepatitis, are lower in patients receiving corticosteroids. In patients with tuberculous pericarditis, use of corticosteroid in addition to anti-TB treatment reduces the risk of death and constrictive pericarditis and promotes treatment adherence. The benefit of preventing constrictive pericarditis outweighs the potential harms of corticosteroid therapy.

6.2 Treating drug-resistant TB

WHO TB Standard 15. In patients with rifampicin-susceptible, isoniazid-resistant TB, 6 months of combination treatment with rifampicin, ethambutol, pyrazinamide and levofloxacin, with or without isoniazid, is recommended.

This recommendation aims to increase cure rates in patients with isoniazid-resistant TB (HR-TB), in whom a 2HRZE/4HR regimen is more likely to fail than in isoniazid-susceptible TB patients[33, 34]. Levofloxacin is only to be used after rifampicin-resistance has been excluded with rapid molecular testing. Ideally, HR-TB treatment is only started after isoniazid resistance and susceptibility to fluoroquinolone have been reliably confirmed. Extending the duration of treatment beyond 6 months may be necessary when HR-TB is detected in the course of a first-line TB treatment or in patients with extensive disease. Streptomycin and other injectable agents are not usually recommended for the treatment of HR-TB.

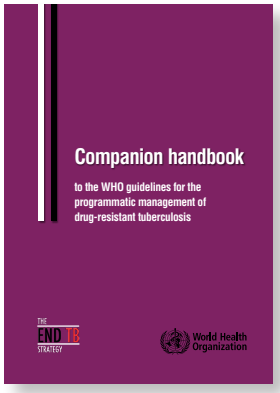
33 WHO treatment guidelines for drug-resistant tuberculosis: 2016 update. October 2016 revision. Geneva: World Health Organization; 2016 (WHO/HTM/TB/2016.04; http://apps.who.int/iris/bitstream/10665/250125/1/9789241549639-eng.pdf?ua=1, accessed 1 June 2017).
34 WHO treatment guidelines for isoniazid-resistant tuberculosis. 2017 Supplement to the WHO treatment guidelines for drug-resistant tuberculosis. Geneva, World Health Organization; 2017 (WHO/HTM/TB/2017.14 (pre-publication version); http://www.who.int/tb/areas-of-work/drug-resistant-tb/treatment/en/, *In press*).



WHO treatment for drug-resistant TB[33] **(under revision)**

WHO TB Standard 16. Patients with multidrug- or rifampicin-resistant TB (MDR/RR-TB) require second-line treatment regimens. MDR/RR-TB patients may be treated using a 9–11 month MDR-TB treatment regimen (the shorter regimen) unless they have resistance to second-line anti-TB agents or meet other exclusion criteria. In these cases, a longer (individualized) regimen with at least five effective anti-TB agents in the intensive phase and four agents in the continuation phase is recommended for 20 months or more. Partial resection surgery has a role in treating MDR-TB.

Most adults and children with pulmonary forms of MDR/RR-TB who do not have additional resistance to fluoroquinolones and injectable agents may be effectively cured with a shorter MDR-TB regimen (Fig. 3).[35] Any deviation from this TB treatment recommendation should only be conducted under proper research conditions. Longer regimens are usually composed of at least pyrazinamide, a fluoroquinolone, an injectable agent and two other second-line medicines from group C (see Table 2), adjusted on the basis of individual drug-susceptibility test results, contraindications and clinical manifestations. Bedaquiline or delamanid may be included in longer regimens to improve treatment outcomes.[36, 37, 38] Both bedaquiline and delamanid have been registered to be used for a duration of 24 weeks. Data on the safety and the added value of continuing these medicines beyond 24 weeks remain limited. However, clinicians and national TB programmes may be compelled to offer to selected MDR-TB patients the use of these medicines beyond 24 weeks; this practice should be conducted under specific conditions, including careful selection of eligible patients, aDSM and patient informed consent.[39] In HIV-positive patients with MDR- or XDR-TB, the early introduction of antiretroviral agents is strongly recommended. Consultation with specialists experienced in treating adult and paediatric TB patients, including surgeons, may be necessary.

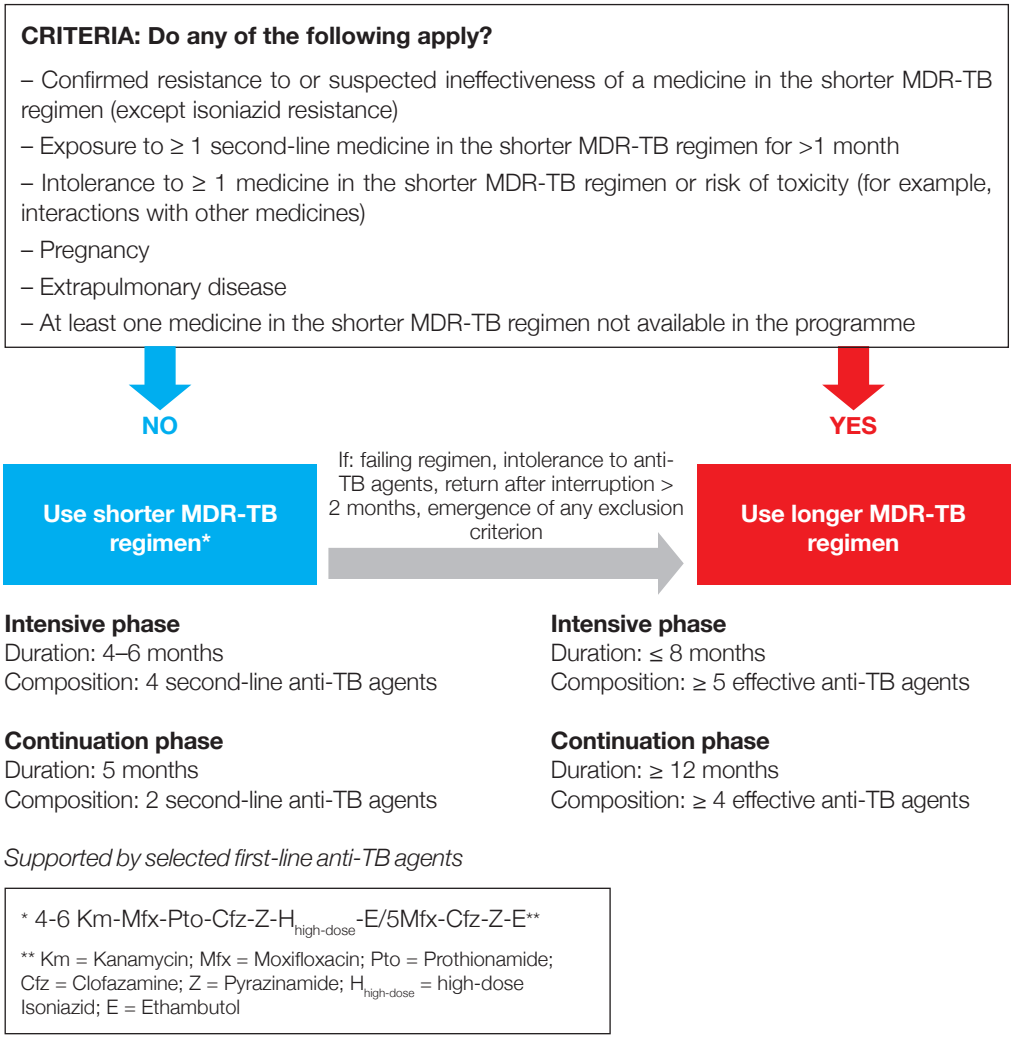


Companion Handbook for the treatment of drug-resistant TB[35] **(under revision)**

35 Companion handbook to the WHO guidelines for the programmatic management of drug-resistant tuberculosis. Geneva: World Health Organization; 2014 (WHO/HTM/TB/2014.11; http://apps.who.int/iris/bitstream/10665/130918/1/9789241548809_eng.pdf, accessed 1 June 2017).
36 The use of bedaquiline in the treatment of multidrug-resistant tuberculosis: interim policy guidance. Geneva: World Health Organization; 2013 (WHO/HTM/TB/2013.6; http://apps.who.int/iris/bitstream/10665/84879/1/9789241505482_eng.pdf, accessed 1 June 2017).
37 The use of delamanid in the treatment of multidrug-resistant tuberculosis: interim policy guidance. Geneva: World Health Organization; 2014 (WHO/HTM/TB/2014.23; http://apps.who.int/iris/bitstream/10665/137334/1/WHO_HTM_TB_2014.23_eng.pdf, accessed 1 June 2017) (**under revision**).
38 The use of delamanid in the treatment of multidrug-resistant tuberculosis in children and adolescents: interim policy guidance. Geneva: World Health Organization; 2016 (WHO/HTM/TB/2016.14; http://apps.who.int/iris/bitstream/10665/250614/1/9789241549899-eng.pdf?ua=1, accessed 1 June 2017) (**under revision**).
39 WHO best-practice statement on the off-label use of bedaquiline and delamanid for the treatment of multidrug-resistant tuberculosis. Geneva: World Health Organization; 2017 (WHO/HTM/TB/2017.20); http://apps.who.int/iris/bitstream/10665/258941/1/WHO-HTM-TB-2017.20-eng.pdf

The programmatic management of drug-resistant TB requires good practices in many aspects of care, including using approved diagnostics to confirm drug resistance, using quality assured medicines, complying with WHO's recommended doses, supporting patients to improve adherence to treatment (including using enablers and evidence-informed digital technologies), and monitoring patients' response and adverse events. Regular microscopy and culture of sputum or other specimens remains important to ensure that treatment failure is detected early.[40]

Fig. 3. Choosing a treatment regimen for patients with multidrug-resistant TB (MDR-TB) or rifampicin-resistant TB



40 Guidelines for the programmatic management of drug-resistant tuberculosis: 2011 update. Geneva: World Health Organization; 2011 (WHO/HTM/TB/2011.6; http://apps.who.int/iris/bitstream/10665/44597/1/9789241501583_eng.pdf, accessed 1 June 2017).

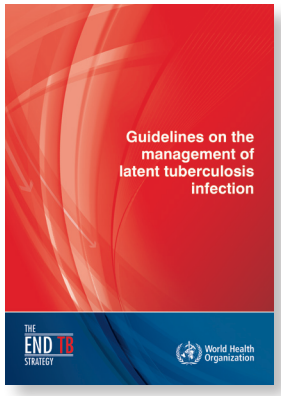
Table 2. General steps in designing a longer treatment regimen for multidrug-resistant TB (MDR-TB)[a] (under revision)

Steps	Medicine: groups and options	
1. Add **one** later-generation fluoroquinolone	A	Levofloxacin Moxifloxacin Gatifloxacin
2. Add **one** second-line injectable agent	B	Amikacin Capreomycin Kanamycin (Streptomycin[b])
3. Add **two or more** second-line agents	C	Ethionamide or prothionamide Cycloserine or terizidone Linezolid Clofazimine
4. Add pyrazinamide and any other first-line agent if they will strengthen the regimen	D1	Pyrazinamide Ethambutol High-dose isoniazid
5. Add bedaquiline or delamanid	D2	Bedaquiline Delamanid
6. Add any of these agents if the regimen cannot be composed otherwise	D3	*p*-aminosalicylic acid Imipenem + cilastatin Meropenem Amoxicillin + clavulanic acid (Thioacetazone)

[a] WHO treatment guidelines for drug-resistant tuberculosis: 2016 update. October 2016 revision. WHO/HTM/TB/2016.04 Geneva: World Health Organization; 2016 (WHO/HTM/TB/2016.04; http://apps.who.int/iris/bitstream/10665/250125/1/9789241549639-eng.pdf?ua=1, accessed 1 June 2017).
[b] Refer to the 2016 guidelines for the conditions under which streptomycin may substitute other injectable agents.

WHO TB Standard 17. A system to actively monitor and manage harms caused by anti-TB agents is required whenever drug-resistant TB patients are treated with novel or repurposed medicines and MDR-TB regimens.

Active TB drug-safety monitoring and management (aDSM) for anti-TB agents refers to the systematic clinical and laboratory assessment of patients being treated with new anti-TB agents or novel MDR-TB or XDR-TB regimens to detect, manage and report suspected or confirmed toxicities[41]. Although all detected adverse events need to be managed clinically, active TB drug -safety monitoring and management requires the reporting of only serious adverse events. As part of a comprehensive safety monitoring and management programme, treatment sites with additional resources may also monitor other adverse events that are clinically significant or of special interest to the programme. Programmes may phase in active safety monitoring and management to eventually cover TB patients being treated with any second-line agents.



Guidelines on the management of latent tuberculosis infection[41]

41 Active tuberculosis drug-safety monitoring and management (aDSM). Geneva: World Health Organization; 2015 (WHO/HTM/TB/2015.28; http://apps.who.int/iris/bitstream/10665/204465/1/WHO_HTM_TB_2015.28_eng.pdf?ua=1, accessed 1 June 2017).

6.3 Treating latent TB infection

WHO TB Standard 18. Persons living with HIV and children younger than 5 years who are household or close contacts of persons with TB and who, after an appropriate clinical evaluation, are found not to have active TB but to have LTBI should be treated.

The systematic diagnosis and treatment of LTBI is part of the new End TB Strategy, and achieving ≥90% LTBI treatment coverage among persons living with HIV and children younger than 5 years who are contacts of TB cases is a global priority target. WHO recommends LTBI treatment for persons living with HIV and children younger than 5 years who are household contacts of a person with pulmonary TB. Depending on the resources available and TB epidemiology, and to move further towards TB elimination, systematic testing and treatment for LTBI should be provided to additional at-risk populations, including all household contacts and clinical risk groups, following WHO's guideline on managing LTBI.[42] There is no evidence showing an association between drug resistance and LTBI treatment; hence, concerns about resistance are not reasons to withhold treatment.

It is critical to exclude active TB disease prior to providing preventive treatment. WHO recommends a simple, symptom-based algorithm to rule out active TB disease in persons living with HIV and children younger than 5 years who are household contacts of someone with TB in high-burden countries, given the algorithm's high negative predictive value. If chest radiography is available, it may be added to augment the utility of the screening to exclude active TB disease, but it is not a requirement.

To implement the programmatic management of LTBI, it is also important to monitor and manage adverse events, provide support to improve adherence to and completion of treatment, and implement monitoring and evaluation systems that use standardized indicators.

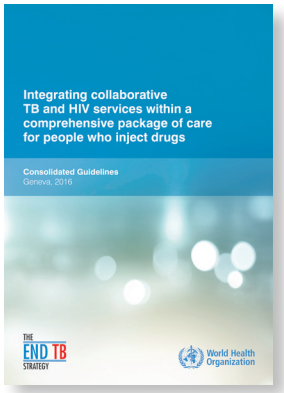
42 Guidelines on the management of latent tuberculosis infection. Geneva: World Health Organization; 2015 (WHO/HTM/TB/2015.01 http://apps.who.int/iris/bitstream/10665/136471/1/9789241548908_eng.pdf?ua=1&ua=1, accessed 1 June 2017).

7. HIV infection and other co-morbid conditions

WHO TB Standard 19. HIV testing should be routinely offered to all patients with presumptive TB and those who have been diagnosed with TB.

Collaborative TB–HIV activities are a key component of the End TB Strategy, and achieving 100% HIV testing is one of the core targets set for 2025. Persons living with HIV are more likely to have poor TB treatment outcomes than HIV-negative TB patients. Close to 40% of persons living with HIV do not know their HIV status. Offering HIV testing and counselling to persons presenting with diagnosed or presumptive TB provides them with access to the continuum of prevention, care, support and treatment for HIV and for TB.

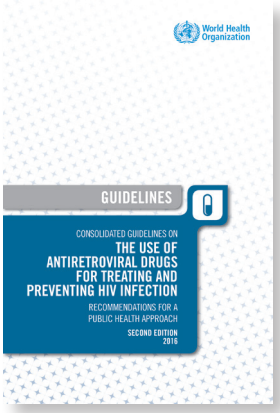
Studies in sub-Saharan Africa and in Asia have shown that a high number of HIV-positive people can be identified when patients presumed to have TB are tested for HIV even when they turn out not to have active TB disease; thus, HIV testing provides a further opportunity to ensure that HIV-positive people enter the HIV continuum of care and receive preventive treatment for TB. The principles that apply to all models of HIV testing in all circumstances are consent, confidentiality, counselling, correct test results and connection to care and treatment. Partners of known HIV-positive TB patients should also be offered voluntary HIV testing and counselling with mutual disclosure. HIV self-testing may be used as an additional strategy to extend HIV testing services to those who may be unable or reluctant to attend for HIV testing.[43, 44, 45]



Integrating collaborative TB and HIV services[43]

WHO policy on collaborative TB/HIV activities[44]

43 Integrating collaborative TB and HIV services within a comprehensive package of care for people who inject drugs: consolidated guidelines. Geneva: World Health Organization; 2016 (WHO/HTM/TB/2016.02; http://apps.who.int/iris/bitstream/10665/204484/1/9789241510226_eng.pdf?ua=1, accessed 1 June 2017).
44 WHO policy on collaborative TB/HIV activities: guidelines for national programmes and other stakeholders. Geneva: World Health Organization; 2012 (WHO/HTM/TB/2012.1; http://apps.who.int/iris/bitstream/10665/44789/1/9789241503006_eng.pdf?ua=1&ua=1, accessed 1 June 2017).
45 Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection: recommendations for a public health approach. 2nd ed. Geneva: World Health Organization; 2016 (http://apps.who.int/iris/bitstream/10665/208825/1/9789241549684_eng.pdf?ua=1, accessed 1 June 2017).



Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection[45]

WHO TB Standard 20. Persons living with HIV should be screened for TB by using a clinical algorithm.

Because persons living with HIV are at a much higher risk of developing active TB disease, HIV services present an ideal opportunity to engage in routine TB case-finding at each visit. Adults and adolescents who report any one of the symptoms of current cough, fever, weight loss or night sweats may have active TB and should be evaluated for TB and other diseases.

WHO-approved rapid molecular diagnostic tests (for example, the Xpert MTB/RIF Ultra assay) should be used as the first test for persons living with HIV because these tests improve the yield and speed of diagnosis for both drug-sensitive and drug-resistant TB among this population; the use of these tests should be scaled up in all clinical settings supporting people with HIV. For HIV-positive persons who are seriously ill, LF-LAM can be used to assist diagnosis. Testing for TB in persons with HIV should always be expedited, and anti-TB treatment should be initiated as soon as possible after diagnosis. In peripheral settings where TB investigations are not available, clinical assessment and judgement should be used to provide presumptive TB treatment for individuals who are seriously ill.

Persons living with HIV in whom active TB has been ruled out should receive TB preventive treatment.

WHO TB Standard 21. Antiretroviral therapy (ART) and routine co-trimoxazole preventive therapy (CPT) should be initiated among all TB patients living with HIV, regardless of their CD4 cell count.

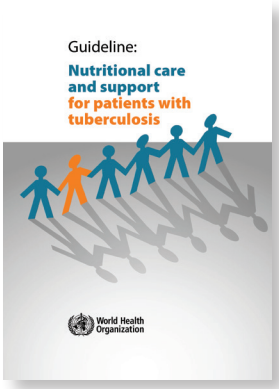
The early initiation of ART for patients with HIV-associated TB is critical to reducing morbidity and mortality. TB treatment should be initiated first, and ART should be started as soon as possible within the first 8 weeks of TB treatment. HIV-positive adults and adolescents with TB who have profound immunosuppression (for example, CD4 counts <50 cells/mm^3) should receive ART within the first 2 weeks of initiating TB treatment. Caution is needed in persons living with HIV who have TB meningitis because immediately initiating ART is significantly associated with more severe adverse events compared with initiating ART 2 months after starting TB treatment. Patients should be followed up carefully to assess whether side effects related to co-treatment occur and whether TB-associated immune reconstitution inflammatory syndrome develops, which is common in patients with TB who start ART, but it is usually self-limiting. The early use of ART is also recommended for HIV-positive TB patients who are treated with second-line anti-TB regimens for drug-resistant TB.

Co-trimoxazole (sulfamethoxazole + trimethoprim) is a broad spectrum antimicrobial agent that prevents a range of secondary bacterial and parasitic infections in HIV-positive adults and children. TB patients living with HIV should receive CPT, and it should be implemented as an integral component of the HIV chronic care package.

HIV and TB programmes should coordinate to ensure that patients diagnosed with HIV-associated TB receive timely treatment and care, and programmes must also ensure the uninterrupted and integrated provision of CPT and ART to all HIV-positive persons who have active TB wherever they receive their care. Programmes should also ensure that TB and HIV services, including TB prevention, are integrated within services for maternal and child health, persons who inject drugs, and for other high risk or vulnerable groups, such as prisoners and miners.

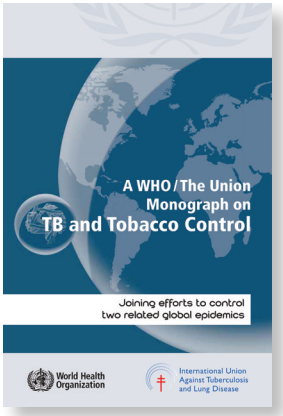
WHO TB Standard 22. A thorough assessment should be conducted to evaluate co-morbid conditions and other factors that could affect the response to or outcome of TB treatment. Particular attention should be given to diseases or conditions known to affect treatment outcomes, such as diabetes mellitus, drug and alcohol abuse, undernutrition and tobacco smoking.

All individuals with active TB should receive an assessment of their nutritional status and appropriate counselling based on their status at diagnosis and throughout treatment. Whether additional specific nutritional care and support are needed depends on these assessments and a number of other factors that make individuals more vulnerable.[46]



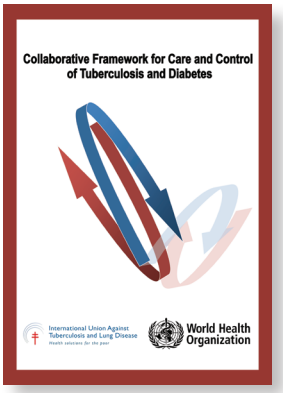
Nutritional care and support for patients with tuberculosis[46]

Persons diagnosed with TB should be asked about smoking and offered advice about cessation if necessary.[47]



TB and tobacco control[47]

Patients with TB should be screened for diabetes at the start of their treatment if resources are available. The management of diabetes in TB patients should be in line with guidelines for managing diabetes.[48]



Framework for care and control of tuberculosis and diabetes[48]

The screening for and management of other co-morbid conditions depends on the epidemiology of the disease and the available resources. Co-morbid conditions may include, for example, the harmful use of alcohol, or other substance abuse and mental health problems.[49]

46 Guideline: nutritional care and support for patients with tuberculosis. Geneva: World Health Organization; 2013 (http://apps.who.int/iris/bitstream/10665/94836/1/9789241506410_eng.pdf?ua=1&ua=1, accessed 1 June 2017).
47 WHO/The Union monograph on TB and tobacco control: joining efforts to control two related global epidemics. Geneva: World Health Organization; 2007 (WHO/HTM/TB/2007.390; http://www.who.int/tobacco/resources/publications/tb_tobac_monograph.pdf, accessed 1 June 2017).
48 Collaborative framework for care and control of tuberculosis and diabetes. Geneva: World Health Organization; International Union Against Tuberculosis and Lung Disease; 2011 (WHO/HTM/TB/2011.15; http://apps.who.int/iris/bitstream/10665/44698/1/9789241502252_eng.pdf, accessed 1 June 2017).
49 Lönnroth K, Williams BG, Jaramillo E, Stadlin S, Dye C. Alcohol use as a risk factor for tuberculosis – a systematic review. BMC Public Health. 2008;8:289. doi: 10.1186/1471-2458-8-289.

8. Managing TB in children

WHO TB Standard 23. The diagnosis of TB in children relies on the thorough assessment of all evidence derived from a careful history (including history of TB contacts and symptoms consistent with TB), clinical examination (including growth assessment), a TST, CXR (if available), bacteriological confirmation whenever possible, investigations for suspected pulmonary TB and suspected EPTB, and HIV testing. Whenever possible, the Xpert MTB/RIF Ultra assay should be used as the initial diagnostic test in children suspected of having any form of TB.

At least 1 million children become ill with TB every year. In 2015, 210 000 children died of TB, a number that includes 40 000 deaths among children who were HIV-positive.

Children can present with TB disease at any age, but in countries where TB is endemic this occurs most commonly when children are between 1 and 4 years old. Pulmonary TB is the most common type of TB in children. Extrapulmonary disease is also common (occurring in around 30–40% of cases) and can present in a variety of anatomical sites. Children who develop TB disease usually do so within one year of infection, which is why the presentation of TB in children is an indicator of recent and ongoing transmission of *M. tuberculosis* in the community. Risk factors for childhood TB include having a household or other close contact with pulmonary TB (especially bacteriologically confirmed pulmonary TB), and being younger than 5 years, HIV-positive and severely malnourished. Infants and young children (especially those younger than 2 years) are at greatest risk of developing severe, disseminated disease and at risk for high morbidity and death.

TB in children is often missed due to the non-specific symptoms (cough, fever and weight loss) and difficulties in diagnosis due to the paucibacillary nature of the disease and the lack of suitable, child-friendly diagnostic tools (young children are unable to produce sputum spontaneously). In addition, to provide sputum specimens, children need to be admitted to hospital because primary health-care workers are usually not trained in sputum aspiration and induction. The majority of children will have negative results on all bacteriological tests; therefore, a negative test result does not exclude TB[50].

Guidance for the management of tuberculosis in children[50]

WHO TB Standard 24. The principles of treating TB in children are the same as for treating TB in adults: first-line treatment of drug-sensitive TB consists of a 2 month intensive phase with isoniazid, rifampicin, pyrazinamide and, depending on the setting and type of disease, ethambutol, followed by a continuation phase with isoniazid and rifampicin for at least 4 months; however, the dose of first-line anti-TB agents differs from that administered in adults.

HIV-positive children with TB require ART and CPT in addition to TB treatment. Infants aged 0–3 months with suspected or confirmed pulmonary TB or tuberculous peripheral lymphadenitis should be promptly treated with

50 Guidance for national tuberculosis programmes on the management of tuberculosis in children. 2nd ed. Geneva: World Health Organization; 2014 (WHO/HTM/TB/2014.03; http://apps.who.int/iris/bitstream/10665/112360/1/9789241548748_eng.pdf?ua=1, accessed 1 June 2017).

the standard treatment regimens, however, experts in treating TB in children advise that treatment may require dose adjustments to reconcile the effects of age and possible toxicity in younger infants.

Children with suspected or confirmed tuberculous meningitis and children with suspected or confirmed osteoarticular TB should be treated with a four-drug regimen (isoniazid, rifampicin, pyrazinamide and ethambutol, known as HRZE) for 2 months, followed by a two-drug regimen (isoniazid and rifampicin, HR) for 10 months, with the total duration of treatment being 12 months. The most recent guidelines on treating children with drug-resistant TB include specific recommendations for treating RR-TB and MDR-TB in children).

For children with mild forms of MDR- or RR-TB, a regimen without injectable agents can be used. If the minimum number of effective TB medicines cannot be composed as described above, delamanid may also be used alongside longer MDR-TB regimens in patients aged 6–17 years.

Although there are no formulations of second-line anti-TB agents for children, treatment outcomes in children are generally good, provided that treatment starts promptly and adherence is maintained until completion. The risk of adverse events is low when the recommended treatment regimens are used. Children should be regularly assessed until treatment is completed. Doses should be adjusted to take into account any weight gain.

WHO TB Standard 25. In settings where TB is highly endemic or where there is a high risk of exposure to TB, a single dose of bacille Calmette–Guérin (BCG) vaccine should be given to all infants; however, HIV-positive children should not be given BCG vaccine. After considering local factors, BCG vaccine should be given to all infants except those who are HIV-positive for whom BCG is contraindicated.

BCG is a live, attenuated vaccine derived from *M. bovis* and with a protective efficacy that varies widely between settings. However, neonatal BCG vaccination provides substantial protection against the more severe types of disseminated TB, such as miliary TB and tuberculous meningitis, to which infants and young children are particularly susceptible. There is no evidence that revaccination with BCG provides any additional protection; therefore, revaccination is not recommended.[51, 52]

BCG vaccine should not be used in HIV-positive children because of the increased risk of severe and potentially fatal disseminated BCG disease. However, BCG is given routinely at birth in settings where TB is endemic before HIV infection can be reliably determined. Hence, several factors need to be considered locally to establish a risk–benefit balance for such approaches.

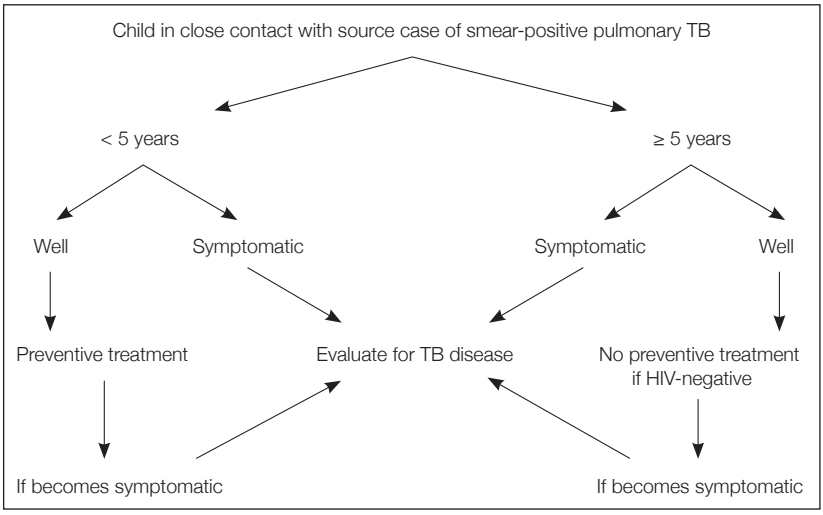
51 Global Advisory Committee on Vaccine Safety, 29–30 November 2006: safety of BCG vaccine in HIV-infected children. *Wkly Epidemiol Rec.* 2007:82;22 (http://www.who.int/wer/2007/wer8203.pdf, accessed 1 June 2017).

52 Global Advisory Committee on Vaccine Safety, 3–4 December 2009: use of BCG vaccine in HIV-infected infants. *Wkly Epidemiol Rec.* 2010;85:32–33 (http://www.who.int/wer/2010/wer8505.pdf?ua=1, accessed 1 June 2017).

WHO TB Standard 26. All children younger than 5 years and HIV-positive children of any age should be included in contact screening and management efforts, with the aim of identifying undiagnosed TB disease and providing preventive therapy for contacts without TB disease who are susceptible to developing disease following exposure to a contact with active TB disease.

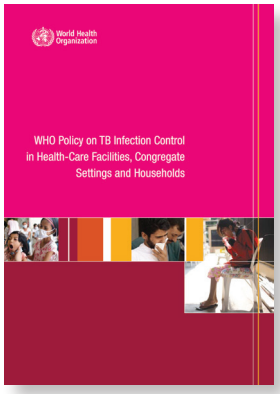
Fig. 4 presents the recommended simple algorithm that can be applied in any setting and requires information only about age, HIV status and the presence or absence of symptoms. Only symptomatic contacts require referral to a secondary level for further assessment; asymptomatic contacts may be prescribed preventive treatment by health workers at the community or primary care level.

Fig. 4. Symptom-based screening algorithm for managing care of children who are close contacts of people with TB



WHO's 2009 recommendations for infection control in health facilities, congregate settings and households do not specifically mention children but are equally relevant to children.[53]

Because children with TB or at risk of TB will enter community or primary health-care services outside the TB programme (such as maternal and child health, nutrition, or HIV services), national TB programmes are encouraged to build links and effective collaboration with these programmes.



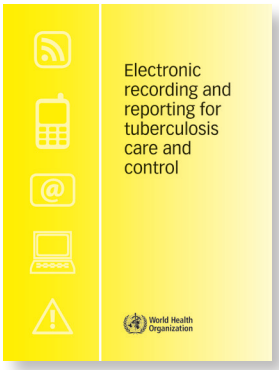
WHO policy on TB infection control in health-care facilities, congregate settings and households[53]

53 WHO policy on TB infection control in health-care facilities, congregate settings and households. Geneva: World Health Organization; 2009 (WHO/HTM/TB/2009.419; http://apps.who.int/iris/bitstream/10665/44148/1/9789241598323_eng.pdf, accessed 1 June 2017).

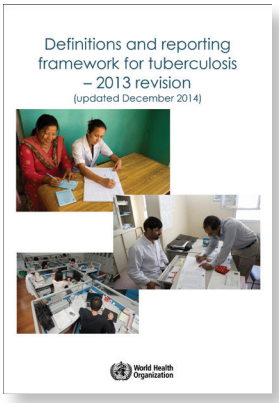
9. Monitoring and evaluation

WHO TB Standard 27. All providers must report both new and re-treatment TB cases and their treatment outcomes to national public health authorities in conformance with applicable legal requirements and policies; TB mortality should be monitored by using standard cause-of-death data from vital registration systems.

The routine monitoring of TB case notifications and treatment outcomes at the national and global levels is long established.[54] National systems generally started as paper-based reporting systems, with aggregated results reported upwards from the lowest administrative level (the Basic Management Unit). Subsequently, many countries have transitioned to electronic case-based reporting systems containing electronic records for which an episode of TB is the unit of analysis. For each episode, records contain relevant information about the person with TB (for example, age, sex, residence, previous history of treatment, personal identification number) and her or his treatment.[55] In cases in which these systems meet quality and coverage standards, they are the best way to track TB incidence. They are also the best way to compile and store data about TB cases, allowing for better quality data, the deduplication of records, greater data access and the timely analysis of any variables that are captured so that these may inform response strategies. Analyses may include data disaggregated by age, sex and location. In addition, core laboratory indicators should be routinely compiled to monitor access to rapid molecular detection of TB, progress towards universal access to DST, and the overall quality of laboratory services.[56]



Electronic recording and reporting for tuberculosis care and control[54]



Definitions and reporting framework for tuberculosis[55]

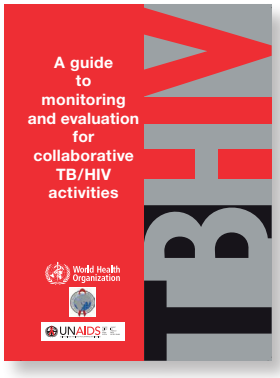
54 Electronic recording and reporting for tuberculosis care and control. Geneva: World Health Organization; 2012 (WHO/HTM/TB/2011.22; http://apps.who.int/iris/bitstream/10665/44840/1/9789241564465_eng.pdf, accessed 1 June 2017).

55 Definitions and reporting framework for tuberculosis – 2013 revision. Updated December 2014. Geneva: World Health Organization; 2013 (WHO/HTM/TB/2013.2; http://apps.who.int/iris/bitstream/10665/79199/1/9789241505345_eng.pdf, accessed 1 June 2017).

56 Framework of indicators and targets for laboratory strengthening under the End TB strategy. Geneva: World Health Organization; 2016 (WHO/HTM/TB/2016.18; http://apps.who.int/iris/bitstream/10665/250307/1/9789241511438-eng.pdf?ua=1, accessed 1 June 2017).

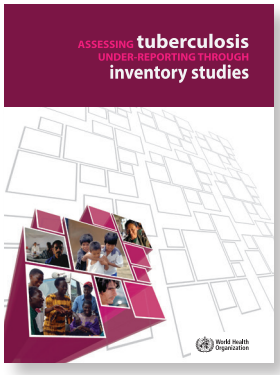
Framework of indicators and targets for laboratory strengthening[56]

Ongoing monitoring of implementation and scale-up of collaborative TB/HIV activities and evaluation of their impact is critically important. The guide to monitoring and evaluation for collaborative TB/HIV activities aims to strengthen implementation of activities and improve quality of care.[57]

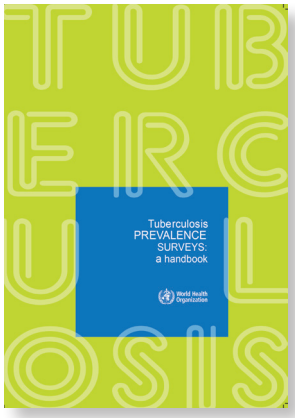


A guide to monitoring and evaluation for collaborative TB/HIV activities[57]

Periodic studies will remain necessary to monitor progress towards targets for reducing TB incidence and mortality, especially in countries without case-based electronic surveillance and high-quality vital registration systems with broad coverage. These studies may include inventory studies to measure the underreporting of detected cases,[58] national TB prevalence surveys undertaken in countries that lack any direct measurement of TB burden,[59] drug-resistance surveys[60] and health-facility surveys of costs faced by TB patients and their households.



Assessing tuberculosis under-reporting through inventory studies[58]

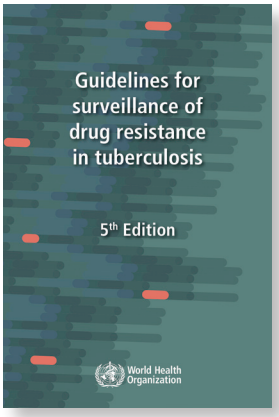


Tuberculosis prevalence surveys[59]

57 A guide to monitoring and evaluation for collaborative TB/HIV activities. Geneva: World Health Organization; 2015 (WHO/HTM/TB/2015.01; www.who.int/hiv/pub/tb/hiv_tb_monitoring_guide.pdf, accessed 1 June 2017).

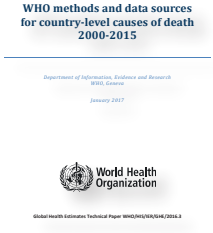
58 Assessing tuberculosis under-reporting through inventory studies. Geneva: World Health Organization; 2012 (WHO/HTM/TB/2012.12; http://apps.who.int/iris/bitstream/10665/78073/1/9789241504942_eng.pdf?ua=1, accessed 1 June 2017).

59 Tuberculosis prevalence surveys: a handbook. Geneva: World Health Organization; 2011 (WHO/HTM/TB/2010.17, http://apps.who.int/iris/bitstream/10665/44481/1/9789241548168_eng.pdf?ua=1&ua=1, accessed 1 June 2017).



Drug-resistance surveillance[60]

The best way to track deaths from all causes, including TB, is through national vital registration systems that use standard coding for the cause of death and that adhere to international standards. Such systems have been in place for more than a century in some countries, but in others they need to be built or further developed to enable reliable monitoring of progress made towards TB mortality targets.[61]



WHO methods and data sources for country-level causes of death 2000–2015[61]

60 Guidelines for the surveillance of drug resistance in tuberculosis. 5th ed. Geneva: World Health Organization; 2012 (WHO/HTM/TB/2015.13; http://apps.who.int/iris/bitstream/10665/174897/1/9789241549134_eng.pdf?ua=1, accessed 1 June 2017).

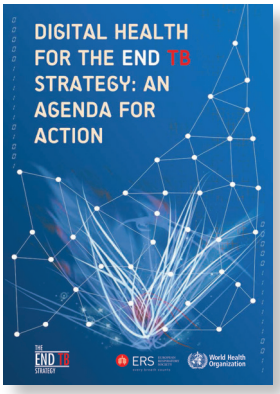
61 WHO methods and data sources for country-level causes of death 2000–2015. Geneva: World Health Organization; 2016 (http://www.who.int/healthinfo/global_burden_disease/GlobalCOD_method_2000_2015.pdf, accessed 1 June 2017).

10. Supportive approaches

10.1 Digital health

WHO TB Standard 28. Digital technologies can be adapted to increase the effectiveness or efficiency of different components of TB programmes.

The potential for information and communication technologies to help combat TB remains largely untapped.[62] Many countries and partners have embarked on eHealth (or electronic health) and mHealth (or mobile health) interventions to enhance patient care, surveillance, programme management, communication and human resource development. WHO's new TB treatment guidelines (2017) recommend using SMS text messages, video communication and electronic medication monitors to support treatment adherence. It is important to invest in digital health products for which evidence already exists and to collect data about their use and impacts, and users' preferences to continue to improve digital technologies.

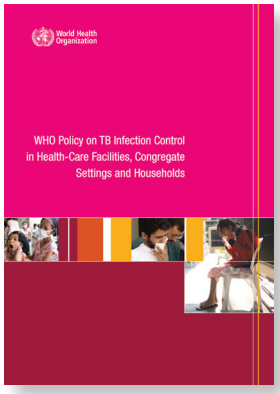


Digital health for the End TB Strategy[62]

10.2 Infection control

WHO TB Standard 29. Promptly identify persons with TB symptoms (triage); provide an adequately ventilated waiting area for them; educate them about cough etiquette and respiratory hygiene; ensure they are prioritized for TB testing; and separate infectious patients.

Triage and separation of patients who have symptoms of TB should be implemented in ways that improve patient flow through the health-care facility. These controls are necessary to minimize the exposure of uninfected patients (particularly those who are immunocompromised) to infectious patients. The controls should be implemented irrespective of the likely or known drug-susceptibility pattern.[63]



WHO policy on TB infection control in health-care facilities, congregate settings and households[63]

To minimize the spread of droplet nuclei, any patient with a cough and respiratory infection – in particular, patients with or suspected of having TB – should be educated about cough etiquette and respiratory hygiene; that is, they must be told about the need to cover their nose

62 Digital health for the End TB Strategy: an agenda for action. Geneva: World Health Organization; 2015 (WHO/HTM/TB/2015.21; http://apps.who.int/iris/bitstream/10665/205222/1/WHO_HTM_TB_2015.21_eng.pdf, accessed 1 June 2017).

63 WHO policy on TB infection control in health-care facilities, congregate settings and households. Geneva: World Health Organization; 2009 (WHO/HTM/TB/2009.419; http://apps.who.int/iris/bitstream/10665/44148/1/9789241598323_eng.pdf, accessed 1 June 2017).

and mouth when sneezing or coughing. Such etiquette also applies to health workers, visitors and families. Physical barriers that can be used to minimize the spread of droplets include a piece of cloth, a tissue or a surgical mask; and such items should be properly disposed of as part of good respiratory hygiene practice.

Hospitalization is generally not recommended to evaluate persons suspected of having TB or to manage the treatment of patients with drug-susceptible TB, except for patients who have concomitant medical conditions that require it. If persons with symptoms of TB are hospitalized, they should not be placed in the same area as susceptible patients or patients with infectious TB. To avoid nosocomial transmission of TB (that is, hospital- or health-care-acquired TB), patients should spend as little time as possible in health-care facilities, including clinics; this can be achieved, for example, by reducing diagnostic delays. Health workers should ensure that high-quality clinical care is provided to infectious patients and minimize the time spent with such patients in areas that are overcrowded or poorly ventilated.

The choice of ventilation system will be based on an assessment of the facility and informed by local programmatic, climatic and socioeconomic conditions. The ventilation system must be monitored regularly and have regular maintenance. Upper-room ultraviolet (UV) germicidal irradiation (known as UVGI) devices are potentially hazardous if improperly designed or installed. In well-designed systems, the principal hazard is inadvertent eye exposure by workers climbing into the high-UV zone for tasks such as painting, cleaning and maintenance. As with any engineering control, UV germicidal irradiation devices must be properly designed, installed, operated and maintained.

Additionally, a comprehensive programme should be implemented to train health workers how to use particulate respirators because the correct and continual use of respirators involves significant behavioural change on the part of health workers. Consideration should be given to including fit testing for respirators.

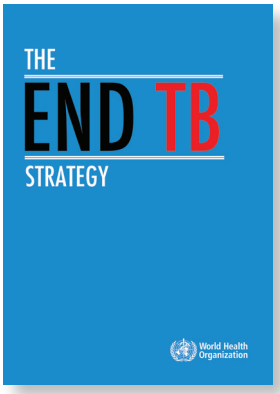
All health workers should be given appropriate information and encouraged to undergo a diagnostic investigation for TB if they have signs and symptoms suggestive of TB. Similarly, all health workers should be given appropriate information about HIV and encouraged to undergo HIV testing and counselling if necessary. 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 ART.

10.3 Patient care and support

WHO TB Standard 30. A patient-centred approach to treatment should be developed to promote adherence, improve quality of life and relieve suffering. This approach should be based on the patient's needs and on mutual respect between the patient and the provider.

Integrated, patient-centred care and prevention focuses on prevention, early detection and treatment and care of all TB patients, including children. Implementing this approach requires close collaboration among all stakeholders, including the social sector, civil society and local communities. The human and financial resources required for implementation should be commensurate with the enhanced scope of core functions that are integrated effectively within delivery. The aim is to ensure that the patient's needs, values, preferences and rights inform the access and delivery of services.[64] Integrated, patient-centred care is fundamental, as well as broader social protection, to the target of eliminating the catastrophic costs for TB patients and affected households by 2020, as set out in the End TB Strategy.

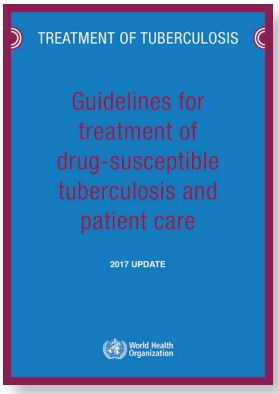
64 The End TB Strategy: global strategy and targets for tuberculosis prevention, care and control after 2015. Geneva: World Health Organization; 2014 (http://www.who.int/tb/strategy/End_TB_Strategy.pdf, accessed 1 June 2017).



The End TB Strategy: global strategy and targets for tuberculosis prevention, care and control after 2015[64]

WHO TB Standard 31. Prior to starting TB treatment, each patient's need for support should be assessed, and interventions to encourage adherence to treatment be offered to improve outcomes.

Patients have better outcomes when interventions to encourage treatment adherence are used, either individually or combined in a package – for example, there are higher rates of treatment success, treatment completion, cure and adherence, and there are lower rates of mortality and loss to follow up. When patients receive treatment adherence interventions in conjunction with directly observed treatment (DOT) or self-administered treatment (SAT), treatment outcomes are significantly improved compared with DOT or SAT alone. Recommended adherence interventions are shown in Table 4. Interventions should be selected after assessing the patient's needs, providers' resources and conditions for implementation[65].



Guidelines for treatment of drug-susceptible tuberculosis and patient care[65]

WHO TB Standard 32. Before starting TB treatment, all patients should be assessed to determine the risk of treatment interruption, and appropriate options for treatment administration should be offered to each patient. Community- or home-based DOT is recommended over health facility–based DOT or unsupervised treatment; and DOT administered by trained lay providers or health-care workers is recommended over DOT administered by family members. Video-observed treatment may replace DOT when the technology is available and can be organized and operated by health-care providers and patients.

Overall, the evidence is inconsistent about whether DOT alone or SAT alone is more likely to encourage treatment adherence. However, some subgroups of patients (such as HIV-positive TB patients) who have other factors affecting treatment adherence are likely to benefit from DOT; also, some specific types of DOT delivery (that is, certain locations of DOT or DOT providers) are more likely to work than others. Community-based or home-based DOT is more likely to encourage adherence than health facility–-based DOT, but family members should not be the first option for administering DOT. Therefore, DOT is better provided at home

65 Guidelines for treatment of drug-susceptible tuberculosis and patient care: 2017 update. Geneva: World Health Organization; 2017 (WHO/HTM/TB/2017.05; http://apps.who.int/iris/bitstream/10665/255052/1/9789241550000-eng.pdf?ua=1, accessed 1 June 2017).

Table 4. Recommended adherence interventions for patients being treated for TB and their providers

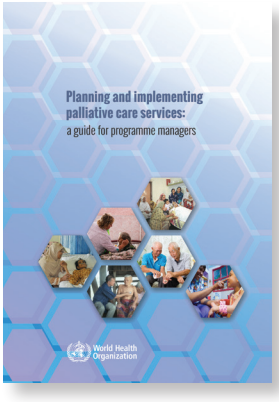
Intervention	Description
Patient education	Health education and counselling about TB and its treatment
Staff education	Education, charts or other visual reminders, educational tools and desktop aids for decision-making
Material support	Food or financial support, such as meals, food baskets, food supplements, food vouchers, transport subsidies, living allowance, housing incentives or a financial bonus; this intervention addresses the indirect costs incurred by patients or their caregivers while accessing health services, and tries to mitigate the consequences of income loss related to the disease
Psychological support	Counselling sessions or peer-group support
Communication with patient	Home visits or mobile telephone communication, such as SMS text messages or telephone calls
Digital medication monitor	A device that measures the time between each opening of a pill box; the monitor may give audible reminders or send SMS text messages to remind patients to take their medications, as well as recording when the box is opened

or in the community by trained lay providers or health-care workers.

The advantage of using video technology is its potential to allow observation of adherence from a distance, even when a patient is travelling and cannot visit or be visited by a DOT provider. Video technology also offers more flexibility because a patient's adherence can be observed at different times of day. Potentially, it could help achieve better levels of patient adherence at a much lower cost and less inconvenience than in-person DOT. Video technology can be used in addition to or interchangeably with in-person DOT. For instance, it is not expected that a patient will use video technology throughout the duration of their treatment.

10.4 Palliative care

Palliative care refers to all measures taken to relieve the suffering of persons affected by a life-threatening condition. Although mortality in TB remains unacceptably high, the priority is to ensure timely access to life-saving treatment. Patients with limited effective treatment options, such as those with MDR-TB, are at high risk of suffering due to the disease, the toxicity of treatment and the sequelae of both.[66]



Planning and implementing palliative care services[66]

66 Planning and implementing palliative care services: a guide for programme managers. Geneva: World Health Organization; 2016 (http://apps.who.int/iris/bitstream/10665/250584/1/9789241565417-eng.pdf, accessed 1 June 2017).

WHO TB Standard 33. All forms of suffering associated with TB should be addressed by ensuring that patients have proper access to care and to the management of adverse reactions to treatment, management of psychological distress, means to prevent and mitigate stigma and discrimination, and by providing access to social protection mechanisms to reduce indirect costs.

Palliative care is not given instead of treatment but in addition to treatment, whenever possible, to patients with limited options for effective treatment. Care that relieves suffering is an integral part of caring for all persons with TB at all times during the course of their illness. National TB programmes and all health-care providers should be aware that suffering is more severe in patients with XDR-TB due to its chronic nature and the limited options for effective treatment; this group should be prioritized for palliative care until highly effective regimens are developed.

Persons with TB for whom all treatment options have been exhausted usually remain a source of TB transmission. The only option for protecting public health while delivering palliative and end-of-life care is to ensure that proper infection control measures are in place at the patient's home, hospital or hospice.

THE
END TB
STRATEGY

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