

Management of Tuberculosis Training for Health Facility Staff

A. Introduction

SECOND EDITION



WORLD HEALTH ORGANIZATION
Geneva



TUBERCULOSIS FOUNDATION

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2009



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WHO Library Cataloguing-in-Publication Data

Management of tuberculosis: training for health facility staff -- 2nd ed.

Contents: Modules: A: Introduction - B: Detect Cases of TB - C: Treat TB Patients - D: Inform Patients about TB - E: Identify and Supervise Community TB Treatment Supporters - F: Manage Drugs and Supplies for TB - G: Ensure Continuation of TB Treatment - H: Monitor TB Case Detection and Treatment - I: TB Infection Control in your Health Facility - J: Field Exercise – Observe TB Management - K: Management of Tuberculosis – Reference Booklet - L: Facilitator Guide - M: Answer Sheets.

1.Tuberculosis, Pulmonary - therapy 2.Health personnel - education 3.Health facilities 4.Teaching materials I.World Health Organization.

ISBN 978 92 4 159873 6

(NLM classification: WF 210)

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WHO/HTM/TB/2009.423a

Introduction

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Acknowledgements

Management of Tuberculosis: Training for Health Facility Staff, 2nd ed.

This second edition of training modules was prepared by the Stop TB Department of the World Health Organization (Geneva, Switzerland) and Patricia Whitesell Shirey of ACT International (Atlanta, GA, USA). The project was coordinated by Karin Bergstrom. Fabio Luelmo and Malgorzata Grzemska were the main technical advisers. The modules were edited by Karen Ciceri. Natacha Barras provided administrative support and coordinated the layout and printing of the modules.

The following organizations contributed to the development of the modules through the Tuberculosis Control Assistance Program (TB-CAP): the American Thoracic Society (ATS), Management Sciences for Health (MSH), the United States Centers for Disease Control and Prevention (CDC), and the KNCV Tuberculosis Foundation.

The original versions of the training modules (published by the World Health Organization in 2003) were field-tested in Malawi through the support of the National Tuberculosis Control Programme of Malawi.

This updated version was tested through the support of the Division of Tuberculosis Elimination of the United States Centers for Disease Control and Prevention.

The United States Agency for International Development financially supported the development of these training modules through its Grant to the World Health Organization and through the sub-agreement to WHO of the Cooperative Agreement with the KNCV Tuberculosis Foundation for the Tuberculosis Control Assistance Program (TB-CAP).

Introduction

What is tuberculosis?

Tuberculosis (TB) is a disease caused by an organism called *Mycobacterium tuberculosis*. These organisms are also known as **tubercle bacilli**. Usually they affect the lungs, in which case the disease is called **pulmonary TB**. Pulmonary TB is the most common type of TB worldwide. Symptoms of pulmonary TB include:

- cough
- bloody sputum
- night sweats
- fever
- weight loss.

When a person with pulmonary TB coughs or sneezes, tubercle bacilli are released into the air in tiny droplets. Other people can breathe in these droplets and become infected.

Tuberculosis that affects organs other than the lungs (such as the lymph nodes, bones and joints, genitourinary tract, meninges, pleura or intestines) is called **extrapulmonary TB**. Patients with extrapulmonary TB are usually not infectious.

Importance of TB as a global public health problem

The World Health Organization (WHO) declared TB a global emergency in 1993 in recognition of its growing importance as a public health problem. About one-third of the world's population is infected with *M. tuberculosis*, which kills more people than any other single infectious disease agent. Worldwide in 2006, there were approximately 9.2 million new cases of TB and 1.7 million TB-associated deaths; 8% of these new cases and 12% of deaths were among people infected with the human immunodeficiency virus (HIV). Some 95% of TB cases and 98% of TB deaths occur in developing countries. Of cases that occur in developing countries, 75% are in the economically productive age group (15–50 years). The African Region has the highest number of new TB cases each year (363 per 100 000 population) and India and China have the greatest TB burden (35% of total global cases).

Incidence is stable or falling in all regions except the African Region and has been decreasing slowly globally since 2003. However, the absolute number of cases is still increasing as a result of population growth. TB prevalence and mortality are decreasing at faster rates (decrease of about 2.5% per year). Of the 14.4 million cases estimated in 2006, half a million (3.5%) had multidrug-resistant TB (MDR-TB).

In 2007, 5.1 million TB cases (55% of those estimated) were reported to WHO, of whom 2.5 million (61% of those estimated) had pulmonary smear-positive TB. Countries implementing

DOTS reported 99% of the 2.5 million new smear-positive cases and achieved a rate of treatment success of nearly 85%.

Once infected with *M. tuberculosis*, a person stays infected for life and may develop symptoms of TB disease at any time. However, among infected people without HIV infection, only 1 in 10 (10%) will develop TB disease; most (90%) will remain healthy. The most important trigger for TB disease is a weakening of the immune system.

Patients with weakened immune systems, such as those with HIV infection, old age and diabetes, are at greater risk of developing TB. In 2000, one-third of HIV-infected individuals worldwide (about 13 million people) were also infected with *M. tuberculosis*. Of people infected with both HIV and *M. tuberculosis*, nearly 50% will become sick with TB during their lifetime; 10% will become sick each year. Thus, the prevalence of HIV in a community has an important effect on the incidence of TB.

Without treatment, 50% of patients with pulmonary TB will die within five years, and 25% will remain sick with chronic, infectious TB. Another 25% will recover spontaneously (because of strong immune defences) but could become sick again at any time.

In this course, the terms “TB patients” and “TB cases” refer to patients in whom TB disease has been diagnosed. Methods of diagnosis will be discussed in module B: *Detect Cases of TB*.

DOTS

DOTS is the basic package that underpins the Stop TB Strategy. It has five components:

- **Sustained political commitment** to increase human and financial resources and make TB control a nationwide priority integral to the national health system;
- **Access to quality-assured TB sputum microscopy** for case detection among people presenting with, or found through screening to have, symptoms of TB (most importantly, prolonged cough);
- **Standardized short-course chemotherapy** for all cases of TB under proper case management conditions, including **direct observation of treatment**;
- **Uninterrupted supply of quality-assured drugs**;
- **Recording and reporting system enabling outcome assessment** of all patients and assessment of overall programme performance.

The Stop TB Strategy

The Stop TB Strategy builds on the successes of DOTS while addressing the key challenges facing TB control. The Stop TB Strategy underpins the Global Plan to Stop TB 2006–2015 and contains six elements:

- **pursuing high-quality DOTS expansion and enhancement**
- **addressing TB/HIV, MDR-TB and the needs of poor and vulnerable populations**
- **contributing to health system strengthening based on primary health care**
- **engaging all care providers**
- **empowering people with TB, and communities through partnership**
- **enabling and promoting research**

This course focuses on those components of DOTS and the Stop TB Strategy that are carried out at the health facility level.

Purpose of this training course

This training course is designed for health workers who are responsible for detecting and managing patients with TB. These workers may include health assistants, medical assistants, nurses, clinical assistants, clinicians or physicians. Some may be private practitioners. Health workers may be male or female. The course is intended mainly for staff with access to sputum smear microscopy for TB but limited or no availability of other diagnostic resources such as X-rays, pathology, culture and drug susceptibility testing (DST) for *M. tuberculosis*. These resources may be accessible by referral to a second-level health facility.

Health workers may work at health centres, hospital outpatient departments, dispensaries or health posts. Throughout this course, the term “health facility” is used to include all types of health services that deliver outpatient care.

In most health facilities, TB control is part of general health-care delivery. TB patients are received along with other types of patients. Improving TB management in particular is therefore part of improving health-care services in general.

The modules contained in this course aim to teach the skills and knowledge that health workers specifically need: detecting cases of pulmonary TB, determining the appropriate drug therapies for TB patients, providing directly-observed treatment, informing patients about TB, and monitoring the success of TB case detection and treatment at the health-facility level. The course does not teach basic medical techniques familiar to health workers, such as how to give injections or the importance of sterilizing needles and syringes.

This course does not teach the medical procedures used by clinicians to diagnose TB in adults and children, manage severe side-effects, treat TB-associated HIV infection, or treat MDR-TB patients. Information about these procedures is contained in other WHO treatment guidelines and appropriate references.¹

¹ Examples of references include:

These training modules indicate when to refer patients to a higher level (second or third level of care) because their care requires more resources or more complex procedures.²

Participants in this course are expected to be able to implement the procedures taught. In order to implement these procedures, health facilities will need:

- supplies for collecting sputum samples (containers, labels)
- access to microscopy for examining sputum samples for TB
- adequate supplies of anti-TB drugs, and
- standard TB forms and registers.

Treatment regimens for TB vary from country to country. Health facilities should follow the specific regimens recommended for TB treatment and control in their national guidelines. The general principles and practices taught in the course are applicable anywhere.

The examples contained in this course apply procedures recommended by WHO for the diagnosis, case management and recording and reporting of TB cases to a model that includes situations common in many countries.

Course methods and materials

This course uses a variety of methods and instruction, including reading, written exercises, discussions, role plays, demonstrations and observations in a real health facility. Practice, whether in written exercises or role plays, is considered a critical element of instruction.

The complete training course includes the following modules (booklets containing units of instruction). Depending on the structure of your course, you may have been given some or all of these modules:

A: Introduction (*includes a glossary with definitions of terms*)

B: Detect Cases of TB

C: Treat TB Patients

D: Inform Patients about TB

E: Identify and Supervise Community TB Treatment Supporters

F: Manage Drugs and Supplies for TB

G: Ensure Continuation of TB Treatment

Frieden T, *Toman's tuberculosis. Case detection, treatment, and monitoring: questions and answers*, 2nd ed. Geneva, World Health Organization, 2003.

Crofton J, Horne N, Miller F. *Clinical tuberculosis*. London, Macmillan, 1999.

Revised guidelines for the programmatic management of drug-resistant tuberculosis. Geneva, World Health Organization, 2008.

Management of drug-resistant tuberculosis: training for health facility staff. Geneva, World Health Organization, 2009 (WHO/HTM/TB/2009.417A–J).

Tuberculosis care with TB-HIV co-management: integrated management of adolescent and adult illness (IMAI). Geneva, World Health Organization, 2007 (WHO/HTM/HIV/2007.01; WHO/HTM/TB/2007.380).

² When there is a need for X-ray, culture or DST, the health facility director or health worker should contact the District TB Coordinator who should be aware of the availability of these tests and the location.

H: Monitor TB Case Detection and Treatment

I: Infection Control in your Health Facility

J: Field Exercise – Observe TB Management

You will also receive:

K: Management of Tuberculosis – Reference Booklet

The *Reference Booklet* contains important forms, worksheets and summaries of procedures taught in the course that can be used as on-the-job resources.

The course is designed for small groups of participants who are led and assisted by “facilitators” as they work through the course modules. Facilitators are not lecturers as in a traditional classroom; their role is to answer questions, provide individual feedback on exercises, lead discussions and structure role plays. For the most part, participants work at their own pace through the modules, although some activities, such as role playing and discussion, require small group work.

The modules may be used in several different ways:

- All of the modules may be completed in sequence without interruption, for example, in a five-day training session.
- One module at a time may be used in a series of short training sessions, for example, one module per week.
- Selected modules may be used in a training session to teach specific skills.
- Modules may be used to train staff on the job for specific activities.
- Health workers may work through modules on their own initiative.
- Modules may be used as a reference for staff in general health facilities.

Learning objectives

Each module provides information and examples that will allow you to practise certain skills necessary for detecting and managing TB cases and monitoring progress. Exercises are provided at the end of each module. The skills and information contained in each module are as follows:

B: Detect Cases of TB

- How to identify TB suspects among sick patients coming for care
- Signs and symptoms compatible with TB and indicators of high TB risk
- How to screen for additional TB suspects
- How to use a *Register of TB Suspects*
- How to collect sputum samples
- How to recommend HIV testing
- How to use sputum microscopy results to identify TB cases
- Steps to inform TB suspects of the sputum microscopy results and initiate additional care

- How to check household contacts of TB cases for TB

C: Treat TB Patients

- How to choose the appropriate TB regimen or decide whether to refer the patient to a clinician for prescription of TB treatment
- How to help the patient decide where to receive directly-observed treatment
- How to prepare a patient's *TB Treatment Card*, including recording diagnostic results, HIV testing and drug therapy, and the TB treatment regimen and dose
- How and when to provide preventive therapy for household contacts of the TB patient
- How to give directly-observed treatment and record it on the *TB Treatment Card*
- How to recognize side-effects and manage them
- How to determine when a patient is due for follow-up sputum examination
- How to decide, based on sputum microscopy, the action needed
- How to determine treatment outcomes

D: Inform Patients about TB

- Communications skills useful for informing patients
- How to inform TB patients and their families about TB and directly-observed treatment (first meeting)
- Messages for TB patients and their families about TB and directly-observed treatment
- How to continue informing the patient throughout treatment (subsequent meetings)
- Continuing messages for TB patients about their regimen (including the drugs, treatment schedule, side-effects, sputum examinations)
- Messages about HIV and TB

E: Identify and Supervise Community TB Treatment Supporters

- How to help the patient choose an effective community TB treatment supporter
- How to train and supply a community TB treatment supporter with anti-TB drugs
- How to resupply the community TB treatment supporter with drugs and review the patient's *TB Treatment Card* on a monthly basis
- Steps to take if the community TB treatment supporter does not collect the next month's drugs

F: Manage Drugs and Supplies for TB

- How to ensure sufficient stock of drugs for TB patients
- How to plan for other needed supplies (such as sputum containers, syringes and needles, and forms)
- Good drug management procedures for safekeeping the supply of anti-TB drugs

G: Ensure Continuation of TB Treatment

- How to coordinate medical referrals and ensure that TB patients continue treatment
- How to coordinate transfer of a TB patient who is moving to another area
- How to arrange for TB patients to continue treatment when travelling
- How to conduct a home visit to a patient who misses a dose
- How to trace a patient who interrupts treatment
- How to plan so that health facility staff are able to conduct home visits and trace patients

H: Monitor TB Case Detection and Treatment

- Key indicators related to TB case detection and how to compile data to monitor case detection
- Key indicators related to HIV testing and HIV status of TB patients and how to compile data to monitor these indicators
- Key indicators related to TB treatment and how to compile data to monitor TB treatment
- How to calculate indicators
- How to analyse indicators
- How to plan appropriate actions to solve problems

I: Infection Control in Your Health Facility

- How to ensure good ventilation in a health facility
- How to improve patient flow in the facility to decrease the risk of TB transmission
- Ways to educate TB suspects, TB patients and their families about cough hygiene
- Precautions for handling sputum specimens
- Precautions for preventing the spread of pathogens in needles
- Ways to reduce your personal risk
- How to stay alert for signs and symptoms of TB and actions to take if they develop

J: Field Exercise – Observe TB Management

- How to review the way that health workers currently identify TB suspects
- How to review the *Register of TB Suspects*
- How to review *TB Treatment Cards*
- How to review additional aspects of TB management such as sputum collection, informing patients about TB and its treatment, and management of drugs and other supplies for TB

Glossary

The definitions provided here refer to the use of terms in the content of this course and are not complete or necessarily valid in other contexts.

accountableresponsible for taking direction from somebody, performing a task or activity and reporting back. Community TB treatment supporters must be accountable to the health facility staff.

acid-fast bacilli (AFB)bacilli that hold stain colour even after washing with acid. Tubercle bacilli are acid-fast bacilli.

adherencefollowing a rule or procedure as directed. For example, for a TB patient, adherence means taking anti-TB drugs as scheduled. See also *compliance*.

anorexia.....loss of appetite.

antiretroviral (ARV)a drug that blocks the action of enzymes that are important for replication and functioning of HIV, resulting in near-complete suppression of HIV replication.

antiretroviral therapy (ART)standardized therapy with antiretroviral drugs that, when taken correctly lifelong, can reduce morbidity and mortality in HIV-infected people. (At least three drugs should be used simultaneously.)

bacillary loadquantity of bacilli present (may reach over 100 million in a single cavity of the lung).

bacillirod-shaped bacteria.

BCG.....bacille Calmette-Guérin, a vaccine against tuberculosis that reduces the risk of disease by 50–80% when given before infection with the microorganism has occurred.

biopsyremoval and examination of tissues, cells or fluids from the living body.

blister packa special package in which capsules or pills are sealed between a plastic layer and a paper or foil layer. Usually, pills or capsules for a certain time period (such as a day or a week) are sealed together in one package with directions for taking them printed on the paper or foil back. The pills or capsules can be pushed out of the package one at a time, as needed.

case of tuberculosisa patient in whom tuberculosis has been bacteriologically confirmed or diagnosed by a clinician.

checking questiona question asked after giving instruction, intended to check the learner's understanding, so that more information can be given if needed.

chemotherapytreatment of disease by chemical agents.

chronic case.....a patient whose sputum tests positive by microscopy examination at the end of a retreatment regimen.

compliancefollowing a rule or procedure as directed. For example, for a TB patient, compliance means taking anti-TB drugs as scheduled.

complyto follow a rule or procedure as directed, for example, to take medicine as directed.

continuation phasethe phase of TB treatment after the initial phase during which the TB patient takes fewer drugs either daily or intermittently. The continuation phase of the New patient regimen lasts 4 months; the continuation phase of the Retreatment regimen lasts 5 months. The continuation-phase regimen is intended to eliminate remaining tubercle bacilli and prevent relapse.

contactsee *household contact*.

conversiona change from sputum smear-positive to sputum smear-negative, or from culture positive to culture negative. Sputum smear conversion is the most useful indicator that initial-phase anti-TB treatment has been effective.

conversion ratethe proportion of new sputum smear-positive cases who are sputum smear-negative after 2 or 3 months of treatment.

convert.....to change from sputum smear-positive to sputum smear-negative, or from culture positive to culture negative.

co-trimoxazole preventive therapy (CPT)....a combination of trimethoprim and sulfamethoxazole given daily to help prevent secondary bacterial infections in people infected with HIV.

culturea method of diagnosis involving growing bacteria in a special medium conducive to their growth.

cure (treatment outcome)....a patient whose sputum smear or culture was positive at the beginning of treatment, but who was sputum or culture negative in the last month of treatment and on at least one previous occasion.

defaultto interrupt (or interruption of) anti-TB treatment for two consecutive months or more.

default
(treatment outcome).....a patient whose treatment was interrupted for two consecutive months or more.

definite case of tuberculosis.....a patient with culture positive for the *Mycobacterium tuberculosis* complex. In countries where culture is not routinely available, a patient with one or more sputum smears positive for acid-fast bacilli (AFB) is also considered a definite case.

denominator.....in a fraction, the number below the line.

diagnostic sputum smear examinationsputum smear examination done by microscope to diagnose pulmonary TB.

died
(treatment outcome).....a patient who dies for any reason during the course of anti-TB treatment.

Directly-observed treatment.....treatment observed by a health worker or a community TB treatment supporter. The health worker or community TB treatment supporter watches the TB patient swallowing the drugs.

DOTS.....the basic package that underpins the Stop TB Strategy.

drug boxa box containing all the anti-TB drugs for a full treatment regimen for one patient.

drug resistanceadaptation of microorganisms so that they are not killed by a drug.

drug susceptibility testing (DST).....isolation and identification of bacterial agents from clinical specimens and standardized testing techniques to determine the susceptibility or resistance of the bacteria to certain antimicrobials.

expired.....(in reference to a drug) past the date at which safety and effectiveness of the drug may become reduced. Expired drugs may be unsafe or ineffective and should be destroyed or returned to the district-level store, or other facility as appropriate.

expiry datethe date on which a drug expires, or becomes possibly less safe and effective.

extrapulmonary TBTB affecting organs other than the lungs, for example, lymph nodes, bones and joints, genitourinary tract, meninges, pleura or intestines.

first-line drug.....the first drug normally used to treat a particular condition. The standard regimens for new TB cases and retreatment cases use first-line drugs.

fixed-dose combination (FDC).....two or more drugs combined in one pill or capsule, in specific dosages, to facilitate correct drug intake.

follow-up sputum smear examinationsputum smear examination done by microscope to assess progress of anti-TB treatment or prove cure (also called “control sputum smear examination”).

genitourinary tract.....genital and urinary organs.

haemoptysisspitting up blood.

hereditygenetic transmission of a quality or trait from parent to child.

household contactsomeone who lives in the same dwelling with the TB patient (sleeps and eats at least one meal there per day).

immune reconstitution inflammatory syndrome (IRIS)a temporary worsening of symptoms and signs of TB after beginning anti-TB treatment that patients with HIV-related TB may experience. This paradoxical reaction in HIV-infected patients with TB is thought to be a result of an enhanced immune inflammatory response that occurs as a result of the simultaneous administration of ART and anti-TB drugs. Symptoms and signs may include high fever, lymphadenopathy, and worsening of chest X-ray findings. A thorough evaluation is necessary to exclude other causes, particularly anti-TB treatment failure, before diagnosing a paradoxical reaction.

incidence.....the number of new cases of a disease occurring in a defined population during a given time period.

indicatora measurable number, proportion, percentage or rate that suggests, or indicates, the extent of a programme’s achievement or the level of some condition among the population.

initial phase	the first phase of anti-TB treatment, lasting two or three months, during which the TB patient takes an intensive drug regimen (4–5 drugs daily). During this phase, sputum conversion usually occurs and clinical symptoms improve.
intermittently	as used in this course, 3 times per week. When treatment is taken intermittently, WHO recommends 3 times a week.
isoniazid preventive therapy (IPT)	self-administered therapy with isoniazid (usually self-administered for 6 months) to prevent development of TB disease in individuals who do not have active TB; limited to individuals at high risk of progressing from TB infection to disease, such as young children and HIV-infected children and adults.
jaundice	yellow skin or eyes caused by damage or failure of the liver.
lymphadenopathy	enlarged lymph nodes.
meninges	the membranes that envelope the brain and spinal cord.
microscopy	examination by means of a microscope.
monitor	to watch closely or check on a routine basis.
mucopurulent	containing both mucus and pus.
multidrug-resistant TB (MDR-TB)	active TB with bacilli resistant to at least rifampicin and isoniazid, the two most powerful first-line anti-TB drugs.
Mycobacterium tuberculosis	tubercle bacillus, that is, the bacillus that causes tuberculosis.
nausea	stomach upset, a feeling that one is about to vomit.
new (type of patient)	a patient who has never had treatment for TB or who has taken anti-TB drugs for less than 1 month.
numerator	in a fraction, the number above the line.
open-ended question	a question that cannot simply be answered “yes” or “no” but requires further response. Questions that begin with “why,” “how,” etc. are open-ended.
other (type of treatment)	patients who were previously treated but for whom the outcome of their previous treatment is unknown; and/or patients who have returned to treatment with smear-negative

pulmonary TB or bacteriologically-negative extrapulmonary disease.

Also patients for whom it is not known whether they have been previously treated.

percentagea part of a whole expressed in hundredths. If 50% of a population is female, it means that 50 out of 100 people are female. The following examples show different ways of expressing the same meaning: $50\% = 0.50 = 50/100$; $4\% = 0.04 = 4/100$.

pleurathe membrane covering the lung and the wall of the chest cavity containing the lungs.

prevalencethe number of all cases of a disease existing in a defined population at a specific point in time or during a given time period.

prognosisthe predicted course that a disease will take; expectations for recovery or decline.

proportionthe relationship of a part to a whole, often written as a decimal fraction or percentage (for example, 0.17 or 17%).

pulmonary TBtuberculosis affecting the lungs.

**pulmonary tuberculosis–
sputum smear-positive**

(PTB+)one or more initial sputum smear examinations positive for acid-fast bacilli (AFB).

**pulmonary tuberculosis–
sputum smear-negative**

(PTB–)a sputum smear examination that is negative for AFB (all samples) **and**
A. Culture positive for *M. tuberculosis*
or
B. A patient for whom a decision is made by a clinician to treat with a full course of anti-TB therapy,
and
Radiographic abnormalities consistent with active pulmonary TB **and either**
• laboratory or strong clinical evidence of HIV infection
or
• if HIV negative (or unknown HIV status living in an area of low HIV prevalence), no response to a course of broad-spectrum antibiotics (excluding anti-TB drugs and fluoroquinolones).

radiographic

abnormalitiesabnormalities that appear in X-rays.

rate	a measure of the frequency of some event in a defined population during a given time period, expressed, for example, as 1.5 per 100 000. Rates may also be expressed as decimal fractions (for example, 0.25) or as percentages (for example, 25%).
referral	sending a patient to another health facility or to a clinician. Patients may be referred for diagnosis, initiation of treatment, or special care/hospitalization for complications, toxicity, etc.
regimen	a plan of treatment specifying which drugs are to be given and the dose, frequency and duration of treatment with each drug.
relapse (type of patient)	a patient previously treated for TB who has been declared cured or treatment completed, and is diagnosed with bacteriologically positive TB (by sputum smear microscopy or culture).
reserve stock	extra stock kept by the health facility to ensure adequate supplies even if there is increased use or a delay in drug delivery.
scanty	result of examination of a sputum sample when fewer than 10 acid-fast bacilli (AFB) are observed.
second-line drug	a therapeutic agent that is not the drug of choice or the first drug normally used to treat a particular condition. Generally, second-line agents are used when standard “first-line” therapy fails. MDR-TB regimens use second-line drugs.
side-effect	a secondary and usually adverse effect of a treatment or drug.
specimen	sample, a small amount (for example, of urine or sputum) to be tested.
sputum	matter ejected from the lungs into the mouth by coughing.
sputum smear microscopy	examination of sputum with a microscope to determine whether acid-fast bacilli (AFB) are present.
sputum smear-negative cases	pulmonary TB patients whose sputum does not contain enough tubercle bacilli to be detectable by microscopy.
sputum smear-positive cases	pulmonary TB patients whose sputum contains tubercle bacilli that are detectable by microscopy.

- stock card**a card kept with each drug and drug strength in the storeroom. The stock card is updated whenever drugs are received or dispensed, so that it always shows the actual balance in stock.
- TB suspect**.....any person who presents with symptoms or signs suggestive of tuberculosis, in particular, cough of long duration (2 weeks or more); other signs or symptoms compatible with TB include bloody sputum, night sweats, fever or weight loss.
- TB treatment supporter**a trained and supervised community member who directly observes a TB patient's treatment. When it is not convenient for a patient to visit the health facility during normal working hours, a TB patient, in collaboration with a health worker, should choose a community TB treatment supporter to directly observe his or her treatment at a more convenient place and time, under the supervision of the health services.
- transfer**as used in this course, changing a TB patient's treatment facility when that patient moves.
- transfer in
(type of patient)**a patient who has been transferred from another TB register to continue treatment.
- transfer out
(treatment outcome)**.....a patient who has been transferred to another recording and reporting unit and for whom the treatment outcome is not known.
- treatment after default
(type of patient)**a patient who returns to treatment, positive bacteriologically, following interruption of treatment for 2 or more consecutive months.
- treatment after failure
(type of patient)**a patient who is started on a retreatment regimen after having failed previous treatment.
- treatment completed
(treatment outcome)**.....a patient who completed treatment but who does not have a negative sputum smear or culture result in the last month of treatment.
- treatment failure
(treatment outcome)**.....a new patient whose sputum smear or culture is positive at 5 months or later during treatment.

Also included in this definition are patients found to harbor a multidrug resistant strain at any point of time during the treatment.

- treatment success**an indicator calculated by adding the number or proportion of patients cured to those who have completed treatment.
- tubercle bacilli**the bacilli that cause tuberculosis (*Mycobacterium tuberculosis*).
- tuberculin test**.....intradermal injection of 0.1 ml of tuberculin (protein extracted from TB bacilli). The test indicates TB infection but not disease. In an individual infected with TB, a hardening of the skin can be observed at the injection site in 48–72 hours.
- tuberculosis (TB)**.....a disease caused by the organism *Mycobacterium tuberculosis*. Not everyone infected with *M. tuberculosis* develops symptoms of TB disease, which may include cough, bloody sputum (haemoptysis), night sweats, fever and weight loss (in pulmonary TB). In this course, TB refers to TB disease rather than the infection without disease.
- window period**the time it takes for a person who has been infected with HIV to react to the virus by creating HIV antibodies; the antibodies are what is detected by an HIV test . Antibodies generally appear within 3 months after infection with HIV, but may take up to 6 months in some individuals.

