

1. DISEASE REPORTING

A. Purposes of Reporting and Surveillance

1. To identify and ensure the adequate evaluation and treatment of persons with TB disease.
2. To identify the contacts of TB cases and ensure their evaluation.
3. To ensure that all eligible infected contacts are offered and complete preventive therapy

B. Legal Reporting Requirements

1. Health care providers: immediately notifiable to local health jurisdiction (WAC 246-101-101).
2. Hospital: immediately notifiable to local health jurisdiction (WAC 246-101-301).
3. Laboratories: initial culture notifiable to local health jurisdiction within two days; (WAC 246-101-201).
4. Local health jurisdictions: notifiable to the Washington State Department of Health (DOH) within 7 days of case investigation or summary required within 21 days (WAC 246-101).

C. Local Health Jurisdiction Investigation Responsibilities

1. Start the initial assessment of the patient within ≤ 1 work day of receiving the case report and do or assure the following:

<http://www.doh.wa.lcl/Portals/1/Documents/Pubs/343-071-WATBManual-Introduction.pdf>

2. Communicate to Washington State TB program staff:
 - Enter case into TB Public Health Issue Management System (PHIMS) within 7 days of the LHJ receiving notification of the suspect case AND
 - Submit the “Contact Investigation Form” to WA State TB Services within 2 weeks.

D. Washington State Tuberculosis Program Core Objectives

1. Index of completion at 12 months (for whom 12 months or less treatment is indicated).
Target: WA – 93%, NTIP ([National TB Indicators Project](#)) – 93%.
2. Sputum culture conversion.
Target: NTIP 61.5%
3. Sputum smear positive results to starting TB medications.
Target: NTIP: 7 days 100%
4. Total contacts evaluated.
Target: WA – 93%, NTIP 93%
5. Contacts who started LTBI treatment who complete treatment.
Target: NTIP 79%
6. Treatment failure rates and relapse rates.
Target: WA \leq 10%

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Tuberculosis, MTB, or TB (short for *tubercle bacillus*) is a common, and in many cases lethal, infectious disease caused by various strains of mycobacteria (MTB Complex) but cultures are most often identified as *Mycobacterium tuberculosis*. (1)

B. Description of Illness

When droplet nuclei are inhaled, most of the larger particles become lodged in the upper respiratory tract, where infection is unlikely to develop. However, smaller droplet nuclei containing the tubercle bacilli may reach the alveoli, where infection begins.

The tubercle bacilli that reach the alveoli are ingested by alveolar macrophages; the majority of these bacilli are destroyed or inhibited. A small number multiply intracellularly and are released when the macrophages die. These bacilli can spread through the lymphatic channels to regional lymph nodes and then through the bloodstream to more distant tissues and organs, including areas in which TB disease is most likely to develop: the apices of the lungs, the kidneys, the brain, and bone. Extracellular bacilli attract macrophages from the bloodstream. The immune response kills most of the bacilli, leading to the formation of a granuloma. At this point the person has TB infection, which can be detected by using the tuberculin skin test or IGRA (IFN-g release assay). It may take 2-10 weeks for the infected person to develop a positive reaction to the tuberculin skin test. Immune responses soon develop to kill the bacilli. Within 2 to 10 weeks after infection, the immune system is usually able to halt the multiplication of the tubercle bacilli, preventing further spread.

Persons who are infected with *M. tuberculosis*, but who do not have TB disease cannot spread the infection to other people. TB infection in a person who does not have TB disease is not considered a case of TB and is often referred to as latent TB infection (LTBI).

When the immune system is not able to halt the multiplication of tubercle bacilli, TB disease results. TB disease presents as pulmonary TB (70%), extrapulmonary TB (30%), or a combination of the two. The symptoms of pulmonary TB include cough, shortness of breath, chest pain, and hemoptysis; the specific symptoms of extrapulmonary TB depend on the site of disease. Systemic symptoms consistent with TB include fever, chills, night sweats, appetite loss, weight loss, and easy fatigability. (1)

C. Tuberculosis in Washington State

Since 2001, crude incidence rates of Tuberculosis (TB) in Washington State (WA) have progressed downward to the lowest rate for this period of 3.0 cases per 100,000 population in 2001. For 2011, this WA rate of 3.0 was lower than the national rate of 3.3 cases per 100,000. The 200 WA cases counted in 2011 represent a 15.3% decline from the 236 cases counted the previous year. In 2011, only 7 of Washington's 39 counties recorded 5 or more TB cases. Together, these 7 counties accounted for 92.0% of the 200 cases counted in WA, along with 71.8% of the state's overall population. King County reported 106 cases, Pierce (25), Snohomish (24), Clark (10), Spokane (8), Yakima (6) and Thurston (5). From 2010 to 2011, Pierce County experienced the largest increase in TB incidence (1.8 to 3.1 per 100,000), while Thurston (5.5 to 2.0) and Clark (5.1 to 2.3) counties saw the greatest declines in incidence.

The greater proportion of TB disease burden in WA continues to be among our foreign-born residents. In 2011, foreign-born residents accounted for 79.5% of TB cases in WA. More than half (59.1%) of the 2011 foreign-born cases developed disease 5 or more years after arrival to the U.S., while 15.3% developed TB within 12 months of arrival.

Most TB cases among foreign-born people are likely the result of reactivation of infection acquired abroad, although some transmission is occurring in the U.S. The risk of disease among the foreign-born also appears related to chronological age and age at immigration; younger people and those who immigrated at younger ages are at lower risk for subsequent infection with TB.

D. Reservoir

Primarily humans, rarely other primates; in some areas, diseased cattle, badgers, swine, and other mammals are infected.

E. Modes of Transmission

TB is spread from person to person through the air. When a person with pulmonary or laryngeal TB coughs, sneezes, speaks, or sings, droplet nuclei containing *M. tuberculosis* are expelled into the air. Depending on the environment, these tiny particles (1–5 microns in diameter) can remain suspended in the air for several hours.

If another person inhales air containing droplet nuclei, transmission may occur. The probability that TB will be transmitted depends on four factors:

1. The infectiousness of the person with TB (the number of organisms expelled into the air),
2. The environment in which exposure occurred,
3. The duration of exposure, and
4. The virulence of the organism.

The best way to stop transmission is to isolate patients with infectious TB immediately and start effective TB therapy. Infectiousness declines rapidly after adequate therapy is started, as long as the patient adheres to the prescribed regimen.

Persons at the highest risk of becoming infected with *M. tuberculosis* from exposure to an infectious case are close contacts (such as household members, immediate family, friends and coworkers) who had prolonged, frequent, or intense contact with a person with infectious TB. Close contacts may be family members, roommates, friends, coworkers, or others. Data collected by CDC since 1987 show that infection rates have been relatively stable, ranging from 21% to 23% for the contacts of infectious TB patients.

Extrapulmonary TB is rarely contagious (except for laryngeal TB); however, transmission from extrapulmonary sites has been reported during aerosol-producing procedures, such as autopsies, bronchoscopes, and tissue irrigation. (1)

F. Incubation Period

From infection to development of a positive Tuberculin Skin Test (TST) or IGRA is 2 to 10 weeks. The risk of developing tuberculosis disease is highest during the 6 months after infection and remains high for 2 years; however, many years can elapse between initial infection and disease. HIV infection and other immunosuppressive diseases increase the

subsequent risk of infection progressing to disease as well as shortening the incubation period.

G. Period of Communicability

Determining the infectious period focuses the investigation on those contacts most likely to be at risk for infection and sets the time frame for testing contacts. Because the start of the infectious period cannot be determined with precision by available methods, a practical estimation is necessary. On the basis of expert opinion, a person should be considered infectious approximately 3 months prior to diagnosis. In certain circumstances, persons may have been communicable for longer than three months prior to diagnosis.) For example, a patient (or the patient's associates) might have been aware of protracted illness (in extreme cases, >1 year). Information from the patient interview and from other sources should be assembled to assist in estimating the infectious period. Helpful details are the approximate dates that TB symptoms were noticed, mycobacteriologic results, and extent of disease (especially the presence of large lung cavities, which imply prolonged illness and infectiousness).

H. Treatment

For most patients, the preferred regimen for treating TB disease consists of an initial 2-month phase of four drugs: isoniazid, rifampin, pyrazinamide, and ethambutol followed by a 4-month continuation phase of isoniazid and rifampin. Streptomycin may be substituted for ethambutol, but must be given by injection. Ethambutol (or streptomycin) can be discontinued when drug susceptibility results show the infecting organism to be fully drug-susceptible. TB treatment regimens may need to be altered for HIV-positive patients taking HIV protease inhibitors. Whenever possible, the care for HIV-related TB should be provided by or in consultation with experts in the management of both TB and HIV disease. The major determinant of the outcome of treatment is patient adherence to the drug regimen. Thus, careful attention should be paid to measures designed to foster adherence, and treating all patients with directly observed therapy (DOT) is strongly recommended.

Multidrug-resistant TB (i.e., TB resistant to both isoniazid and rifampin) presents difficult treatment problems and requires expert consultation. The consequences of treatment failure and further acquired drug resistance make DOT a high priority for cases of drug-resistant TB.

For additional information regarding treatment of TB:

<http://www.doh.wa.lcl/Portals/1/Documents/Pubs/343-071-WATBManual-TreatmentofTBDisease.pdf>

3. CASE DEFINITIONS

A. Laboratory Case Definition

- Isolation of *M. tuberculosis* complex from a clinical specimen. The use of rapid identification techniques for *M. tuberculosis* performed on a culture from a clinical specimen, such as DNA probes and high-pressure liquid chromatography (HPLC), is acceptable under this criterion.

OR

- Demonstration of *M. tuberculosis* from a clinical specimen by nucleic acid amplification (NAA) test. NAA tests must be accompanied by cultures of mycobacterial species. However, for surveillance purposes, CDC will accept results obtained from NAA tests approved by the Food and Drug Administration (FDA) and used according to the approved product labeling on the package insert, or a test produced and validated in accordance with applicable FDA and Clinical Laboratory Improvement Amendments (CLIA) regulations.

OR

- Demonstration of acid-fast bacilli (AFB) in a clinical specimen when a culture has not been or cannot be obtained or is falsely negative or contaminated; historically this criterion has been most commonly used to diagnose TB in the postmortem setting.

B. Clinical Case Definition. In the absence of laboratory confirmation of *M. tuberculosis* complex after a diagnostic process has been completed, person must have all of the following criteria for clinical TB:

- Evidence of TB infection based on a positive tuberculin skin test result or positive interferon gamma release assay for *M. tuberculosis*

AND

- One of the following:
(1) Signs and symptoms compatible with current TB disease, such as an abnormal chest radiograph or abnormal chest computerized tomography scan or other chest imaging study

OR

(2) Clinical evidence of current disease (e.g., fever, night sweats, cough, weight loss, hemoptysis)

AND

- Current treatment with two or more anti-TB medications

4. DIAGNOSIS AND LABORATORY SERVICES

A. Diagnosis

Persons suspected of having TB should be referred for a medical evaluation, which should include:

- a medical history
- a physical examination
- a test for TB including
- a Mantoux or IGRA
- a chest radiograph
- any appropriate bacteriologic or histologic examinations.

Positive bacteriologic cultures for *M. tuberculosis* confirm the diagnosis of TB. Clinicians should not wait for bacteriologic culture results before starting therapy. Therapy should be started when the potential risks of TB exceed the risk of therapy.

<http://www.doh.wa.lcl/Portals/1/Documents/Pubs/343-071-WATBManual-LaboratoryServices.pdf>

B. Tests Available at Washington State Public Health Laboratory (WA PHL)

All laboratories that identify a positive *M. tuberculosis* specimen on Washington residents are required to submit a reference isolate to the WA PHL. The PHL Mycobacteriology Unit serves as a reference laboratory for the identification of mycobacterial strains as well as performing several other diagnostic tests. It also facilitates referral of all culture and specimens for genotyping and specimens needing molecular detection of drug resistance.

Table 1: Bacteriologic Tests Performed at WA PHL

Test	Description	Laboratory Turnaround Times
Acid-Fast Bacilli (AFB) Smear	<ul style="list-style-type: none"> Provides the physician with a preliminary confirmation of the diagnosis. It usually is the first bacteriologic evidence of the presence of mycobacteria in a clinical specimen. If positive, gives a semiquantitative estimate of the number of bacilli being excreted (which is of vital clinical and epidemiologic importance in assessing the patient's infectiousness). 	<ul style="list-style-type: none"> Within 24 hours from receipt of specimen in the laboratory.⁴⁷
Nucleic Acid Amplification (NAA) Assay	<ul style="list-style-type: none"> A test done on sputum specimens for the direct and rapid identification of the <i>Mycobacterium tuberculosis</i> complex. Allows for the amplification of specific target sequences of nucleic acids that will be detected by a nucleic acid probe. Does not replace the need for routine AFB smear and culture.⁴⁹ 	<ul style="list-style-type: none"> Within 2-3 working days from receipt of specimen in the laboratory.^{50,51}
Culture	<ul style="list-style-type: none"> Usually necessary for species identification of all clinical specimens suspected of containing mycobacteria. Is required for drug susceptibility testing and genotyping. 	<ul style="list-style-type: none"> Mycobacterial growth detection: within 14 days from specimen collection Identification of mycobacteria: within 21 days from specimen collection^{52,53}

Drug Susceptibility Testing	<ul style="list-style-type: none"> • For first-line drugs: Is performed on initial isolates of all patients to identify an effective antituberculosis regimen. • For both first-line and second-line drugs: Is repeated on interim isolates when a patient remains culture-positive after 3 months of treatment.^{54,55} 	<ul style="list-style-type: none"> • First-line drugs: within 30 days from specimen collection. • Second-line drugs: within 4 weeks from date of request. ^{56,57}
Drug Resistance Screening by Sequencing (DRSS)	<ul style="list-style-type: none"> • Allows rapid confirmation of MDR TB through the identification of genetic mutations associated with RIF and INH resistance – MDR case. Also the DRSS examines the genetic loci that are associated with resistance to the most effective second-line drugs, fluoroquinolones (FQ) and the injectables amakacin (AMK), kanamycin (KAN) and capreomycin (CAP) will be examined. ⁵⁸ 	<ul style="list-style-type: none"> • DRSS results are available within 3-4 business days from the receipt of specimen at the WA PHL laboratory. • DRSS is a presumptive test and needs to be confirmed by traditional susceptibility testing. WA PHL performs confirmation for the First line drugs (up to 14 days MTBC identification) and Second line drug (28 days from the receipt of the specimen [reference cultures] or MTBC identification).

C. Specimen Collection

WA PHL information can be found at:

<http://www.doh.wa.lcl/PublicHealthandHealthcareProviders/PublicHealthLaboratories.aspx>

Information regarding the TB Specimen Collection kits can be found at:

<http://www.doh.wa.lcl/DesktopModules/DNNCorp/DocumentLibrary/Components/FileDownloader/FileDownloaderPage.aspx?pid=1&ift=1&did=4758>

All specimens should be submitted with a completed PHL FORM:

<http://www.doh.wa.lcl/portals/1/Documents/Pubs/MTBIsolates.pdf>

5. ROUTINE CASE INVESTIGATION

For detailed information regarding case investigations and a Diagnosis of TB Check List, see:

<http://www.doh.wa.lcl/Portals/1/Documents/Pubs/343-071-WATBManual-DiagnosisofTBDisease.pdf>

A. Evaluate the Diagnosis / Assess the Patient

1. **When a suspected or confirmed case of tuberculosis (TB) disease is reported to the local public health agency: Receive the case report**
2. **Take infection control precautions (see Section 6 of TB guidelines)**

3. Perform the initial assessment of the patient:

- Start the initial assessment within ≤ 1 business day of the case report for infectious patients; and ≤ 3 business days of the case report for others.
- Consult with medical provider, local health officer, or DOH TB Medical Consultant within ≤ 1 business day of the case report
- Conduct an initial interview of the patient and visit the patient's home:
 - If the patient is hospitalized, conduct the initial assessment during the patient's hospitalization. If the patient is not hospitalized, conduct the initial assessment at the first clinic visit or during a home visit
 - Collect and submit 3 sputum samples for AFB smear and culture (if not done earlier). Obtain specimens 8 to 24 hours apart with one being an early morning specimen
 - Visit the patient's home (if initial visit occurred in the hospital) within ≤ 3 business days of hospital discharge
 - Reinterview the patient within 1 to 2 weeks after the initial interview
- If the patient is hospitalized outside of his or her county of residence: The role of the LHJ TB Program in the county in which the patient is hospitalized is to coordinate with the LHJ TB Program in the county of the patient's residence.
- Assure medical evaluation of the patient within 1 week of referral
- Submit the "Tuberculosis Contact Investigation Form" to WA State TB Services within 2 weeks
- Use the data collected from the physician consultation(s), record review, and patient interviews to complete the following tasks:
 - Review demographic information
 - Ascertain the extent of TB illness
 - Review the patient's health history
 - Determine the index patient's infectious period (count 3 months back from start of symptoms-cough, weight loss, fever, chest pain, night sweats)
 - Evaluate the patient's knowledge and beliefs about TB
 - Administer, measure, and interpret a Mantoux TST or IGRA
 - Screen for HIV
 - Obtain baseline biochemistry tests (CBC, liver function) for toxicity monitoring (order tests based on drug regimen and for special situations such as HIV infections, history of liver disease, alcoholism, and pregnancy):
 1. Complete blood count
 2. Platelets
 3. Liver function tests
 4. Uric acid measurements

- Assure MD physical exam
- Assure that face-to-face initial encounters and skin testing or IGRA are conducted among high and medium priority contacts within 7 business days after their being listed in the investigation
- Submit the “TB Contact Investigation Form” to WA State TB Services within 2 weeks

GUIDELINES FOR THE EVALUATION OF PULMONARY TUBERCULOSIS IN ADULTS IN FIVE CLINICAL SCENARIOS

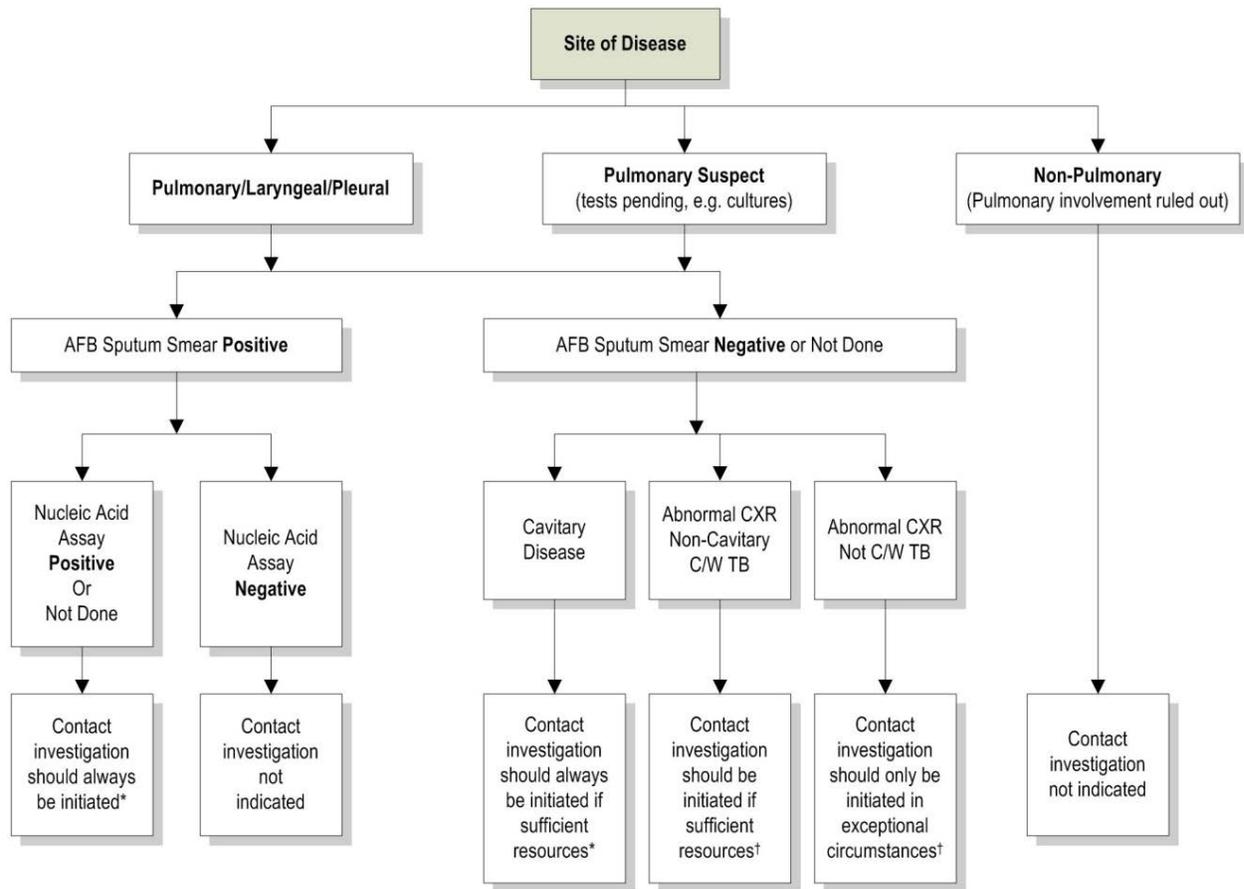
Patient and Setting	Recommended Evaluation
Any patient with a cough of $\geq 2-3$ weeks' duration	Chest radiograph: if suggestive of tuberculosis (TB)*, collect 3 sputum specimens for acid-fast bacilli (AFB) smear microscopy, culture, and nucleic acid amplification (NAA). NAA testing is available at DOH Public Health Lab (PHL).
Any patient at high risk for TB with an unexplained illness, including respiratory symptoms of $\geq 2-3$ weeks' duration	Chest radiograph: if suggestive of TB, collect 3 sputum specimens for AFB smear microscopy, culture, and NAA (available at PHL).
Any patient with human immunodeficiency virus (HIV) infection and unexplained cough or fever OR any patient at high risk for TB with a diagnosis of community-acquired pneumonia who has not improved after 7 days of treatment	Chest radiograph; and collect 3 sputum specimens for AFB smear microscopy, culture, and NAA (available at PHL).
Any patient at high risk for TB with incidental findings on chest radiograph suggestive of TB even if symptoms are minimal or absent ^{†§}	Review of previous chest radiographs, if available, 3 sputum specimens for AFB smear microscopy, NAA (available at PHL), and culture.
<p>* Opacities with or without cavitation in the upper lobes or the superior segments of the lower lobes.</p> <p>§ Chest radiograph performed for any reason, including targeted testing for latent TB infection and screening for TB disease.</p>	

Source: Adapted from: ATS, CDC, IDSA. Controlling tuberculosis in the United States: recommendations from the American Thoracic Society, CDC, and the Infectious Diseases Society of America. *MMWR* 2005;54(No. RR-12):33.

B. Identify Potentially Exposed Persons and Potential Sites of Transmission

Determine if a contact investigation is needed. Contact investigations are conducted for persons with suspected or confirmed pulmonary, laryngeal, or pleural tuberculosis (TB) disease with the following:

- Pulmonary cavities and/or
- Respiratory specimens positive for acid-fast bacilli (AFB) in the sputum smear



Source: CDC. Guidelines for the investigation of contacts of persons with infectious tuberculosis: recommendations from the National Tuberculosis Controllers Association and CDC, and guidelines for using the QuantiFERON®-TB Gold test for detecting *Mycobacterium tuberculosis* infection, United States. *MMWR* 2005;54(No. RR-15):5.

If an investigation is indicated, start the contact investigation within ≤ 1 business day of the case report

- Determine the start of the index patient's infectious period
<http://www.doh.wa.lcl/Portals/1/Documents/Pubs/343-071-WATBManual-ContactInvestigation.pdf>
- At the first patient interview the patient to identify contacts exposed during this period
- Determine places where the patient spent time during the infectious period and where transmission may have occurred
- Time frames for contact evaluation and treatment
<http://www.doh.wa.lcl/Portals/1/Documents/Pubs/343-071-WATBManual-ContactInvestigation.pdf> (pg 9.23)

C. Environmental Evaluation

A field investigation includes visiting the patient's home or shelter, workplace/school (if any), and the other places where the patient said he or she spent time while infectious. The field investigation is important and should be done even if the patient interview has already been conducted. The purpose of the field investigation is to evaluate the environmental characteristics of the place or places in which exposure may have occurred. The field investigation may provide additional information for use in the risk assessment and identify additional contacts.

During field visits, the healthcare worker should do the following:

- **Observe environmental characteristics**, such as room size, crowding, and ventilation, to estimate the risk of tuberculosis (TB) transmission.
- **Identify additional contacts** (especially children) and their locating information, such as phone numbers and addresses.
- **Look for evidence of other contacts** who may not be present at the time of the visit (for example, pictures of others who may live in or visit the house, shoes of others who may live in the house, or toys left by children).
- **Interview and apply skin tests (TST's) or draw blood for IGRA testing on high- and medium-priority contacts** who are present and arrange for reading the results of the TST's.
 - <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5415a1.htm>, Figure 2
- **Educate the contacts** about the purpose of the contact investigation, the basics of transmission, the risk of transmitting *Mycobacterium tuberculosis* to others, and the importance of testing, treatment, and follow-up for TB infection and disease.
- **Refer contacts who have TB symptoms** to the local health jurisdiction or a community based healthcare provider for a medical evaluation, including radiography and sputum collection.

6. CONTROLLING FURTHER SPREAD

Background

There are three types of infection control measures. The first are administrative controls, which are primarily aimed at early identification, isolation, and appropriate treatment of infectious patients. The second are environmental controls, which focus on preventing the spread and reducing the concentration of infectious droplet nuclei in the air. The third is personal respiratory protection, which may provide additional protection for healthcare workers in high-risk settings such as isolation rooms and cough-inducing or aerosol-generating procedures.

Personal Respiratory Protection:

Although administrative controls and environmental controls are most effective in controlling the spread of TB, they do not eliminate the risk of transmission entirely. Personal respiratory protection, the third level of infection control, is also used in higher-risk settings.

- http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5417a1.htm?s_cid=rr5417a1_e, Appendix C

The purpose of a respirator is to reduce exposure by filtering out TB bacilli from room air before the air is breathed into a person's lungs. Respirators used for TB control should be approved for use by the National Institute for Occupational Safety and Health (NIOSH).

A. Infection Control Recommendations / Case Management

1. Hospitalized patient: Isolate the patient, if necessary (if the patient has positive acid-fast bacilli [AFB] sputum smear results and/or cavitary disease) or high suspicion for active TB disease even if smear negative. Advise staff to take personal respiratory precautions, if necessary
2. Non-hospitalized patients with sputum smear positive TB should not attend school, go to work, fly on commercial airlines, etc. For additional information, regarding infection control: <http://www.doh.wa.lcl/Portals/1/Documents/Pubs/343-071-WATBManual-InfectionControl.pdf>
3. Confirm the completion of treatment
 - Verify completion of treatment after treatment was started based on:
 - Regimen
 - Interruptions
 - Response to treatment
 - Number of weeks on DOT
 - Number of doses taken
 - Submit patient updates to DOH using PHIMS and hardcopy records of ongoing contact investigations

B. Contact Management

During the initial encounter with a contact, which should be accomplished within 3 working days of the contact having been identified; the investigator gathers background health information and makes a face-to-face assessment of the person's health. Administering a TB test at this time accelerates the diagnostic evaluation.

The health department record should include:

- previous *M. tuberculosis* infection or disease and related treatment;
- contact's verbal report and documentation of previous TST results;
- current symptoms of TB illness (e.g., cough, chest pain, hemoptysis, fever, chills, night sweats, appetite loss, weight loss, malaise, or easy fatigability);
- medical conditions or risk factors making TB disease more likely (e.g., HIV infection, intravenous drug use, diabetes mellitus, silicosis, prolonged corticosteroid therapy, other immunosuppressive therapy, head or neck cancer, hematological and reticuloendothelial diseases, end-stage renal disease, intestinal bypass or gastrectomy, chronic malabsorption syndrome, or low body weight);

- mental health disorders (e.g., psychiatric illnesses and substance abuse disorders);
- type, duration, and intensity of TB exposure; and
- sociodemographic factors (e.g., age, race or ethnicity, residence, and country of birth) (see Data Management and Evaluation of Contact Investigations).

For more information: <http://www.doh.wa.lcl/Portals/1/Documents/Pubs/343-071-WATBManual-ContactInvestigation.pdf>

C. Environmental Measures

During field visits, the healthcare worker should observe environmental characteristics, such as room size, crowding, and ventilation, to estimate the risk of tuberculosis (TB) transmission. Air volume, exhaust rate, and circulation assist in predicting the likelihood of transmission in an enclosed space. In large indoor settings, the degree of proximity between contacts and the index patient can influence the likelihood of transmission. The most practical system for grading exposure settings is to categorize them by size (e.g., “1” being the size of a vehicle or car, “2” the size of a bedroom, “3” the size of a house, and “4” a size larger than a house). The volume of air shared between an infectious TB patient and contacts dilutes the infectious particles. Local circulation and overall room ventilation also dilute infectious particles, but both factors have to be considered because they can redirect exposure into spaces that were not visited by the index patient. (2)

7. MANAGING SPECIAL SITUATIONS

A. TB Outbreaks

A TB outbreak indicates potential extensive transmission. 1) A TB patient was contagious, 2) contacts were exposed for a substantial period, and 3) the interval since exposure has been sufficient for infection to progress to disease. An outbreak investigation involves several overlapping contact investigations, with a surge in the need for public health resources. More emphasis on active case finding is recommended, which can result in more contacts than usual having chest radiographs and specimen collection for mycobacteriologic assessment.

B. Congregate Settings:

Outbreak cases can be distinguished from other cases only when certain associations in time, location, patient characteristics, or *Mycobacterium tuberculosis* attributes (e.g., drug resistance patterns or genotype) become apparent. In low-incidence jurisdictions, any temporal cluster is suspicious for an outbreak. A working definition of a potential *TB outbreak* is helpful for planning and response, and may include any of the following six criteria (based on surveillance and epidemiology):

1. An increase in TB cases has occurred which is above the expected number of TB cases
2. During and because of a contact investigation, two or more contacts are identified as having TB disease, regardless of their assigned priority (i.e., high, medium, or low priority)
3. Any two or more cases occurring within one year of each other are discovered to be linked, and the linkage is established outside of a contact investigation (e.g., two patients who received a diagnosis of TB disease outside a contact

investigation are found to work in the same office and only one or neither of the persons was listed as a contact to the other)

4. A genotype cluster leads to discovery of one or more verified transmission links that were missed during a contact investigation within the prior two years

Criteria based on program resources:

5. Transmission is continuing despite adequate control efforts by the TB control program
6. Contact investigation associated with increased cases requires additional outside help

C. Transportation Modes:

Transmissions of *M.tuberculosis* have been confirmed on vessels at sea, commercial aircraft, passenger trains and buses. Investigations should be made when single flight exposure time is >8 hours as currently recommended for commercial airline travel.

D. Multiple Drug Resistant (MDR) and Extreme Drug Resistant (XDR) TB:

The occurrence of drug resistance does not change recommendations for assigning contact priorities. Special consideration should be given to instances when resistance is acquired during treatment or when drug resistance was detected late during the treatment course, because these patients might have had prolonged periods of infectiousness. Treatment regimens for infected contacts require expert consultation.

8. ROUTINE PREVENTION

A. Vaccine Recommendations

None.

B. Prevention Recommendations

State and local health departments have the primary responsibility for preventing and controlling TB. However, other health care providers who provide TB services also have responsibility for preventing and controlling TB in their communities. Prevention and control efforts should include three priority strategies: (1) identifying and treating all persons who have TB disease, (2) finding and evaluating persons who have been in contact with TB patients to determine whether they have TB infection or disease, and treating them appropriately, and (3) testing high-risk groups for TB infection to identify candidates for treatment of latent infection and to ensure the completion of treatment.

<http://www.doh.wa.lcl/Portals/1/Documents/Pubs/343-071-WATBManual-DiagnosisofLTBI.pdf>

ACKNOWLEDGEMENTS

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UPDATES

April 2012: Updated the document using the following sources:

Washington State Department of Health. TB Services Manual. [Online] January 1, 2012.

<http://www.doh.wa.lcl/YouandYourFamily/IllnessandDisease/Tuberculosis/ProviderMaterials/TBServicesManual.aspx>.

Centers for Disease Control and Prevention. RVCT Instruction Manual. [Online] June 2009.

<http://www.cdc.gov/tb/programs/rvct/InstructionManual.pdf>.

Additional References

1. **Heymann, David L.** *Control of Communicable Diseases Manual*. s.l. : American Public Health Association, 2008.
2. *Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-Care Settings*. s.l. : MMWR 2005; 54(No. RR-17, 1-141), 2005.

For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TDD/TTY 1-800-833-6388).