Diagnosis of Latent Tuberculosis Infection

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Quick Start Check List: Diagnosis of Latent Tuberculosis Infection

The tasks listed below should be performed by licensed nursing, medical, and laboratory staff according to Idaho statute.

Steps for Diagnosis of Latent Tuberculosis Infection (LTBI)	Instructions and Forms (Be sure to consult your local protocols and standing orders for each step as well)
Determine whom to test	Examples of forms can be found in chapter 17.
Conduct tuberculin skin testing ▪ ≥5 mm is considered positive for any contact[1] or anyone considered to be high risk for developing TB disease[2] ▪ 10 mm is positive for those persons with recent infection or clinical conditions of increased risk ▪ 15 mm is positive for persons at low risk ▪ A skin test conversion has occurred when a person has a baseline negative skin test that when retested within 2 years has a reaction size of 10 mm greater than baseline ▪ A positive reaction to tuberculin in a bacille Calmette-Guérin (BCG)-vaccinated person indicates infection with *M. tuberculosis* in many cases, so it should not be discounted. Consult with the state TB program staff or your clinician consultant if you have any questions.	See http://www.cdc.gov/mmwr/pdf/rr/rr5415.pdf page 15 for cutoff values for contacts See http://www.cdc.gov/mmwr/PDF/rr/rr4906.pdf Table 7, page 24 for cutoff values for all persons tested for LTBI, and CDC definition of "skin test conversion" See http://www.cdc.gov/mmwr/PDF/rr/rr4906.pdf Table 7, page 25 for CDC language on interpreting a skin test in someone with history of BCG vaccination Examples of forms can be found in chapter 17.
Screen for human immunodeficiency virus (HIV) if indicated Consider screening persons at risk for HIV	Examples of forms can be found in chapter 17.
Obtain chest radiography for patients with positive tuberculin skin test results To exclude active pulmonary tuberculosis disease, chest radiography is indicated for all persons being considered for treatment of LTBI. ▪ Children younger than 5 years of age should have posterior-anterior and lateral views ▪ Pregnant women with recent infection should have chest radiography with shielding as soon as feasible, even during the first trimester Tuberculin-positive persons with normal chest radiographs and no symptoms suggesting extrapulmonary disease are candidates for treatment for LTBI	Examples of forms can be found in chapter 17.
Evaluate all persons with abnormal chest radiograph and/or symptoms suggestive of extrapulmonary disease for active TB.	Examples of forms can be found in chapter 17.
Steps for Follow up of Patients Diagnosed with Latent Tuberculosis Infection	**Instructions and Forms**
Determine whether to treat the patient	Discuss with state TB program staff or your TB consultant if there are questions.

Introduction

Purpose

Use this section to understand and follow national and Idaho guidelines to

- Classify patients with latent TB infection (LTBI)
- Diagnose LTBI

In the 2005 guideline, "Controlling Tuberculosis in the United States: Recommendations from the American Thoracic Society, Centers for Disease Control and Prevention, and the Infectious Diseases Society of America," one of the recommended strategies to achieve the goal of reduction of TB morbidity and mortality is the identification of other persons with LTBI at risk for progression to TB disease, and treatment of those persons with an effective drug regimen.[3]

Contacts are mentioned within this section, but their evaluation and follow-up are covered in more depth in the Contact Investigation section. For information on treatment, refer to the Treatment of Latent Tuberculosis Infection section.

Guidance

In Idaho:

- Contacts should be evaluated as described in the Contact Investigation section.

For roles and responsibilities, refer to the "Roles, Responsibilities, and Contact Information" topic in the Introduction.

Forms

Required and recommended forms are available on the Tuberculosis Forms website, http://healthandwelfare.idaho.gov/Health/DiseasesConditions/Tuberculosis/TuberculosisForms/tabid/854/Default.aspx .

Tuberculosis Classification System

The system for classifying tuberculosis (TB) is based on how the infection and disease develop in the body. Use this classification system to help track the status of TB in your patients and to allow comparison with other reporting areas.

TABLE 1: TUBERCULOSIS CLASSIFICATION SYSTEM[4]

Class	Type	Description
0	▪ No tuberculosis (TB) exposure ▪ Not infected	▪ No history of exposure ▪ Negative reaction to the tuberculin skin test (TST) or interferon gamma release assay (IGRA)
1	▪ TB exposure ▪ No evidence of infection	▪ History of exposure ▪ Negative reaction to the TST or IGRA
2	▪ TB infection ▪ No disease	▪ Positive reaction to the TST or IGRA ▪ Negative bacteriologic studies (if done) ▪ No clinical, bacteriologic, or radiographic evidence of TB disease
3	▪ TB disease ▪ Clinically active	▪ *Mycobacterium tuberculosis* complex cultured (if this has been done) ▪ Clinical, bacteriologic, or radiographic evidence of current disease
4	▪ TB disease ▪ Not clinically active	▪ History of episode(s) of TB Or ▪ Abnormal but stable radiographic findings ▪ Positive reaction to the TST or IGRA ▪ Negative bacteriologic studies (if done) And ▪ No clinical or radiographic evidence of current disease
5	▪ TB suspect	▪ Diagnosis pending

Source: Adapted from: CDC. Classification system. In: Chapter 2: transmission and pathogenesis. Core Curriculum on Tuberculosis (2000) November 2001. Available at: http://www.cdc.gov/tb/education/corecurr/index.htm. Accessed March 4, 2010.

High-Risk Groups

Certain factors identify persons at high risk for tuberculosis (TB) infection and/or for progression to TB disease. Persons in the high-risk groups listed in Table 2: **Persons at High Risk for Tuberculosis Infection and Progression to Tuberculosis Disease** are candidates for tuberculin skin testing in Idaho. (This table can also be found in chapter 3 “Targeted Testing for Latent Tuberculosis Infection” and chapter 5 “Diagnosis of Tuberculosis Disease”.)

Persons with risk factors from both columns may be at much higher risk than those with risk factors in only one column. For example, an individual born in a high TB prevalence country with HIV infection is at much higher risk of having active TB than a U.S.-born individual with HIV infection.

TABLE 2: PERSONS AT HIGH RISK FOR TUBERCULOSIS INFECTION AND PROGRESSION TO TUBERCULOSIS DISEASE[5]

For Tuberculosis Infection	For Progression to Tuberculosis Disease[6]
▪ High-priority contacts such as housemates or coworkers or contacts of persons who have smear-positive pulmonary or laryngeal tuberculosis (TB) ▪ Infants, children, and adolescents exposed to adults in high-risk categories ▪ Recent immigrants (<5 years) from countries with high incidence of TB (Asian, African, Latin American, and Eastern European countries have TB rates 5–30 times higher than U.S. rates, and an increasing percentage of TB cases here are occurring among immigrants from those countries) ▪ Recent immigrants from Mexico ▪ Migrant workers ▪ Persons who have recently spent over 3 months in high-incidence countries (such as missionaries from the Church of Jesus Christ of Latter-Day Saints) ▪ Native Americans ▪ Persons with high rates of TB transmission: • Homeless persons • Injection drug users • Persons with human immunodeficiency virus (HIV) infection • Persons living or working in institutions with individuals at risk for TB such as: ▪ Hospitals, especially staff in nursing, emergency departments, and laboratories ▪ Long-term care facilities ▪ Homeless shelters ▪ Residences for acquired immunodeficiency syndrome (AIDS) patients ▪ Correctional facilities	▪ Persons with HIV infection ▪ Infants and children aged <5 years ▪ Persons infected with *Mycobacterium tuberculosis* within the previous 2 years ▪ Persons with a history of untreated or inadequately treated TB disease ▪ Persons with radiographic findings consistent with previous TB disease ▪ Persons who use alcohol or illegal drugs (such as injection drugs or crack cocaine) ▪ Persons with any of the following clinical conditions or other immunocompromising conditions: • Silicosis • Diabetes mellitus • End-state renal disease (ESRD)/chronic renal failure, hemodialysis • Some hematologic disorders (e.g., leukemias and lymphomas) • Other malignancies (e.g., carcinoma of head, neck, or lung) • Body weight ≥10% below ideal body weight • Prolonged corticosteroid use • Use of other immunosuppressive treatments (e.g., prednisone or tumor necrosis factor-alpha [TNF-α] antagonists) • Organ transplantation • Gastrectomy • Chronic malabsorption syndromes • Jejunoileal bypass

Source: Adapted from: CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. MMWR 2005;54(No. RR-17):4–5; CDC. Targeted tuberculin testing and treatment of latent tuberculosis infection. MMWR 2000;49(No. RR-6):7-9.

Diagnosis of Latent TB Infection

Mantoux Tuberculin Skin Testing

The Mantoux method of tuberculin skin testing is used to detect infection with *Mycobacterium tuberculosis*.

In general, it takes two to 10 weeks after infection for a person to develop a delayed-type immune response to tuberculin measurable with the Mantoux tuberculin skin test (TST).[7] During the test, tuberculin is injected into the skin. The immune system of most persons with tuberculosis (TB) infection will recognize the tuberculin, causing a reaction in the skin. Repeated TSTs do not produce hypersensitivity.

The size of the measured induration (a hard, dense, raised formation) and the patient's individual risk factors should determine whether TB infection is diagnosed.[8] Based on the sensitivity and specificity of the purified protein derivative (PPD) TST and the prevalence of TB in different groups, three cut-points have been recommended for defining a positive tuberculin reaction:

- Greater than or equal to 5 mm of induration,
- Greater than or equal to 10 mm of induration
- Greater than or equal to 15 mm of induration[9]

For more information on cut-points for the TST, see the “Interpretation of the Tuberculin Skin Test” topic in this section.

For diagnosing latent TB infection (LTBI), blood tests called interferon gamma release assays (IGRAs) including QuantiFERON®-TB may eventually be available in Idaho. Some labs in neighboring states are already performing the test. For more information, contact the Idaho State TB Program at 208-334-5939.

Candidates for Mantoux Tuberculin Skin Testing

The Mantoux TST can be administered to all persons, including pregnant women,[10] persons who have previously been vaccinated with bacille Calmette-Guérin (BCG),[11] and human immunodeficiency virus (HIV)-infected persons. However, persons with a documented prior positive TST do not need another TST, persons with a previous allergic reaction should not be retested, and the Mantoux TST should not be administered until four weeks after vaccination with live-virus vaccines.

If the person being tested is a contact, follow the procedures outlined in the Contact Investigation section.

Pregnancy

Tuberculin skin testing is entirely safe and reliable for pregnant women, and pregnant women at high risk for TB infection or disease should be tested. Consider screening pregnant women for TB infection if they have any of the following conditions:

- Symptoms suggestive of TB disease
- HIV infection
- Behavioral risk factors for HIV
- Medical conditions other than HIV infection that increase the risk for TB disease
- Close contact with a person who has pulmonary or laryngeal TB disease
- Immigration from an area of the world where incidence of TB is high

Bacille Calmette-Guérin Vaccine

BCG vaccines are live vaccines derived from a strain of Mycobacterium bovis. Because their effectiveness in preventing infectious forms of TB has never been demonstrated in the U.S., they are not recommended as a TB control strategy in the U.S. except under rare circumstances. They are, however, used commonly in other countries, usually in newborns, to reduce the risk of extrapulmonary TB, in particular meningeal TB . A history of BCG vaccination is not a contraindication for tuberculin skin testing, nor does it influence the indications for a TST. Administer and measure TSTs in BCG-vaccinated persons in the same manner as in those with no previous BCG vaccination.

Diagnosis and treatment of LTBI should be considered for BCG-vaccinated persons with a TST reaction of equal to or greater than 10 mm induration, especially any of the following:

- Persons continually exposed to populations with a high prevalence of TB (e.g., some healthcare workers, employees and volunteers at homeless shelters, and workers at drug treatment centers)

- Persons born or have lived in a country with a high prevalence of TB
- Persons exposed to someone with infectious TB, particularly if that person has transmitted TB to others[12]

Evaluate these patients for symptoms of TB. If a patient has symptoms of TB disease, obtain chest radiography and (if the patient is coughing) collect sputum specimens. A person with a documented history of treatment for LTBI does not need to have treatment repeated unless a new exposure to TB has occurred, and they are being managed as a contact to an active case of TB.

Bacille Calmette-Guérin Talking Points

1. Tuberculin reactivity caused by BCG vaccination wanes with time but can be boosted with a TST.[13]
2. A diagnosis of *M. tuberculosis* infection should be considered for any BCG-vaccinated person who has TST reaction ≥10 mm of induration.[14]
3. Treatment for LTBI should be considered for a person who is TST positive and has previous BCG vaccination if the person is:
   - A contact of infection TB or
   - Vaccinated and born in (or resided in) a country of high prevalence of TB or
   - Exposed to persons at risk for TB[15]
4. BCG vaccination should be considered for infants and children who reside in high morbidity countries to prevent meningeal TB.[16]
5. There is no scientific evidence of protective ability of BCG for preventing *pulmonary* TB in adolescents or adults.[17]

Anergy Testing

Anergy testing is not routinely recommended in conjunction with TST for any patients, even those infected with HIV.

Factors limiting the usefulness of anergy skin testing include the following:

- Problems with standardization and reproducibility
- Low risk for TB associated with a diagnosis of anergy
- Lack of apparent benefit of treatment for LTBI in groups of anergic HIV-infected persons[18]

Documented Prior Positive Tuberculin Skin Test

Persons who have tested positive in the past and can provide documentation of their status should not have another TST. Instead, they should be screened with a chest

radiograph or have a TB symptom assessment questionnaire administered to identify any symptoms of TB disease.[19]

Live-Virus Vaccines

The Mantoux TST can be administered in conjunction with all vaccines. However, the measles (MMR) vaccine—and possibly mumps, rubella, varicella, and live attenuated influenza vaccines—may transiently suppress the response to PPD.[20] Therefore, if a vaccine containing live virus (e.g., measles, smallpox) has already been given, the TST should be deferred for (or repeated) at least four weeks after the vaccine was administered.

When giving TST and MMR, one of the following three sequences should be used:

- Apply TST at same visit as MMR
- Delay TST at least four weeks if MMR is given first
- Apply TST first, then give MMR when TST is measured[21]

Multiple Puncture Tests

Multiple puncture tests (MPTs), such as the Tine test, should not be used. The MPTs are not reliable because the amount of tuberculin injected intradermally cannot be precisely controlled and there is no standard for interpretation.

Administration of the Tuberculin Skin Test

The TST should be placed by a healthcare worker who has received appropriate training and is following written protocols.

TABLE 3: BEFORE YOU BEGIN TO ADMINISTER A TUBERCULIN SKIN TEST

Before You Begin to Administer a TST	
Review Information	CDC. *Mantoux Tuberculin Skin Test Facilitator Guide at:* http://www.cdc.gov/tb/education/Mantoux/default.htm Infection control procedures (including hand washing before and after the procedure and the use of gloves and a sharps container)
Gather Equipment	▪ Gloves ▪ Alcohol pads or alternative skin cleanser ▪ Safety needle ▪ Tuberculin syringe (Do not pre-draw tuberculin into syringes prior to test.) ▪ Purified protein derivative (PPD) (Tubersol® or Aplisol®: See the warning in the text below in this table.) ▪ Sharps container Note: Opened PPD tuberculin vials must be dated and discarded after 30 days. See the package insert for appropriate storage information.

Read the PPD labels carefully before administering a TST. The packaging of tetanus toxoid-containing vaccines (TTCVs) is similar to Tubersol® and Aplisol® and all are refrigerated. See the CDC's "Errors Involving Mix-up of Tuberculin Purified Protein Derivative and Vaccine Products" (TB Notes Newsletter. 2005;No. 1) at this hyperlink: http://www.tbchicago.org/tbguidecdc/newsletters/notes/TBN_1_05/Errors_mix_up.htm.

How to Administer a Tuberculin Skin Test

1. If the patient's written consent is required, obtain it per health department requirements.
2. Inject air into the vial air space (not into the solution). Injection of air into the air space in the vial prevents creation of negative pressure within the vial, allowing the antigen to be withdrawn easily. Injecting air into the solution creates bubbles and may interfere with withdrawing the correct amount of antigen.[22]
3. The injection should be placed on the palm-side-up surface of the forearm, about two to four inches below the elbow. Your local institutional policy may specify the right or left forearm for the skin test. The area selected should be free of any barriers to placing and reading the skin test, such as muscle margins, heavy hair, veins, sores, tattoos, or scars.
4. After choosing the injection site, clean the area with an alcohol swab by circling from the center of the site outward. Allow the site to dry completely before the injection.
5. Using a disposable tuberculin safety needle and syringe, inject 0.1 ml of PPD tuberculin containing 5 tuberculin units (TU) intradermally with the needle bevel facing upward. Because some of the tuberculin solution can adhere to the inside of the plastic syringe, the skin test should be given as soon as possible after the syringe is filled.
6. The injection should produce a discrete, pale elevation of the skin (a wheal) 6 to 10 mm in diameter. Note: If a 6 to 10 mm wheal is not produced, repeat the test on the opposite arm or the same arm, 2 inches from the original site.
7. Record the date and time of TST administration, location of injection site, dose, name of person who administered the test, name and manufacturer of tuberculin product used, lot number, expiration date, and the reason for testing.[23]

Measurement of the Tuberculin Skin Test

A trained healthcare worker should read the TST 48 to 72 hours after the intradermal injection. **Patients should never be allowed to read their own TSTs.**[24]

- A positive reaction can be measured anytime after 48 hours.
- If the results appear negative and more than 72 hours have passed, the test should be repeated. It can be repeated immediately, or after one week, if two-step testing is required.

A topic titled "Two-Step Tuberculin Skin Testing" topic will be provided in the Infection Control section of this manual.

TABLE 4: BEFORE YOU BEGIN TO MEASURE A TUBERCULIN SKIN TEST

Before You Begin	
Review Information	CDC. *Mantoux Tuberculin Skin Test Facilitator Guide* at http://www.cdc.gov/tb/education/Mantoux/default.htm

How to Measure a Tuberculin Skin Test

1. Measure the TST site crosswise to the axis of the forearm (from the thumb side of the arm to the little finger side of the arm or vice versa). (Picture from the Epidemiology page of the Eastern Idaho Public Health District[*])
2. Induration is a hard, dense, raised formation. Measure only induration hardness and not swelling around the site of the injection. **Do not measure erythema (redness).** A TST with erythema, but no induration, is nonreactive.
3. Record the test result in mm, not as "positive" or "negative." An exact reading in mm may be necessary to interpret whether conversions occur on a subsequent test. Record a TST with no induration as "0 mm." Where there is induration, do not round off the reading, but record it exactly as read.
4. Report adverse reactions to a TST (e.g., blistering, ulcerations, necrosis) to the FDA's MedWatch Program at 1-800-FDA-1088, or via the Internet at this hyperlink: http://www.fda.gov/medwatch/ .

[*] http://www2.state.id.us/phd7/HPPS/Surveillance/Epidemiology%20Main.htm

Interpretation of the Tuberculin Skin Test

TSTs should be interpreted by a trained healthcare worker. Use Tables 12 and 13 below to interpret TSTs.

Call the local health jurisdiction regarding TST reactions for which interpretation and medical follow-up are unclear

TABLE 5: BEFORE YOU BEGIN TO INTERPRET A TUBERCULIN SKIN TEST

Before You Begin	
Review Information	CDC. *Mantoux Tuberculin Skin Test Facilitator Guide* at http://www.cdc.gov/tb/education/Mantoux/default.htm

How to Interpret a Tuberculin Skin Test

Use the table below. Source: http://www.cdc.gov/mmwr/PDF/rr/rr4906.pdf Table 7, page 24.

TABLE 6: POSITIVE TUBERCULIN SKIN TEST REACTIONS

Induration Size	Considered Positive For:
5 mm or more	▪ Persons with human immunodeficiency virus (HIV) infection/acquired immunodeficiency syndrome (AIDS) ▪ Recent contacts of an infectious case of tuberculosis (TB) disease ▪ Persons with fibrotic lesions on chest radiograph consistent with healed TB ▪ Persons with organ transplants or other immunosuppressed persons (such as those receiving the equivalent of >15 mg/day of prednisone for >1 month) ▪ Persons receiving treatment with tumor necrosis factor-alpha (TNF-α) antagonists
10 mm or more	▪ Foreign-born persons recently arrived (within 5 years) from countries with a high TB incidence or prevalence (e.g., most countries in Africa, Asia, Latin America, Eastern Europe, Former USSR), or from refugee camps ▪ Persons who inject drugs or use other high-risk substances, such as crack cocaine ▪ Alcoholics ▪ Residents and employees in high-risk, congregate settings (e.g., correctional institutions; long-term residential care facilities such as nursing homes, mental institutions, etc.; hospitals and other healthcare facilities; homeless shelters; and refugee camps) ▪ Mycobacteriology laboratory personnel ▪ Persons with other medical conditions that increase the risk of TB disease ▪ Children younger than 5 years of age, or children and adolescents exposed to adults in high-risk categories

Induration Size	Considered Positive For:
15 mm or more	▪ Persons with no known risk factors for TB

When interpreting TST results, be aware of the following.

Skin test conversions: For persons previously skin tested, an increase in induration of 10 mm or more within a two-year period is classified as a conversion to positive. For example, a person with a previous reading of 4mm who now is 14mm is considered positive, even if they have no known risk factors for TB. See http://www.cdc.gov/mmwr/PDF/rr/rr4906.pdf Table 7, page 24 CDC definition of "skin test conversion"

False-negative reactions may be due to the following:

- Anergy (See "Anergy Testing" in the topic "Candidates for Mantoux Tuberculin Skin Testing" in this section.)'
- Recent TB infection (within the past 10 weeks)
- Very young age (less than 6 months of age because the immune system is not fully developed)
- Overwhelming TB disease
- Vaccination with live viruses (e.g., measles, mumps, rubella, varicella, oral polio, and yellow fever). Note: TB skin testing should be done either on the same day as vaccination with live virus or at least four weeks after vaccination. (See "Live-Virus Vaccines" in the topic "Candidates for Mantoux Tuberculin Skin Testing" in this section.)
- Some viral infections (measles, mumps, chickenpox, and HIV)
- Corticosteroids and other immunosuppressive agents given for two or more weeks

False-positive reactions may be due to the following:[25]

- Nontuberculous mycobacteria (NTM) or mycobacterium other than *M. tuberculosis* (MOTT)
- BCG vaccination (See “Bacille Calmette-Guérin Vaccine” in the topic “Candidates for Mantoux Tuberculin Skin Testing” in this section.)

Human Immunodeficiency Virus Screening

The Centers for Disease Control and Prevention (CDC) recommends the following:

- Routine HIV screening for all patients ages 13–64 seeking health care for any reason, without regard to patient’s known risks for HIV infection
- Annual HIV screening of patients known to be at high risk[26]

Follow-Up Activities

After testing, complete the following tasks:

- **If the person has signs or symptoms of TB**, evaluate for TB disease as described in the “Diagnosis of Tuberculosis Disease” topic in this section. Refer to Table 3: **When to Suspect Pulmonary Tuberculosis in Adults.**

- **If the person is a contact,** follow the procedures for testing and evaluation in the Contact Investigation section.

- **If the person is a participant in two-step screening,** see “Two-Step Tuberculin Skin Testing”.

- **If the tuberculin skin test (TST) result is positive,** a chest radiograph should be obtained for the patient as specified in the “Chest Radiography” topic in this section.

Chest Radiography

All individuals being considered for LTBI treatment should undergo a chest radiograph to rule out pulmonary TB disease if the skin test results suggest LTBI. For information on how to classify TB, see the “Tuberculosis Classification System” topic at the beginning of this section.

A posterior-anterior radiograph of the chest is the standard view used for the detection and description of chest abnormalities in adults. In some instances, other views (e.g., lateral, lordotic) or additional studies (e.g., computed tomography [CT] scans) may be necessary.

Children younger than five years of age should receive posterior-anterior and lateral radiographs.[27]

For more information on chest radiography, refer to the Francis J. Curry National Tuberculosis Center's *Radiographic Manifestations of Tuberculosis: A Primer for Clinicians* (Francis J. Curry National Tuberculosis Center Web site; 2006) at this hyperlink: http://www.nationaltbcenter.ucsf.edu/products/product_details.cfm?productID=EDP-04 .

For persons recently exposed to TB, follow the procedures for testing and evaluation in the Contact Investigation section.

TABLE 7: TARGETED TESTING FOR LATENT TUBERCULOSIS INFECTION: WHEN CHEST RADIOGRAPHS ARE REQUIRED AND HOW TO FOLLOW UP ON RADIOGRAPHY RESULTS

Signs or Symptoms of TB Disease?	TST or IGRA Result?	Recent Exposure to Infectious TB?	Chest Radiograph?	Follow-up Action
Yes	Positive or negative	Yes or no	CXR Required: Yes Results: normal or abnormal	▪ Classify as Class 5. ▪ Evaluate for TB disease. Refer to the Diagnosis of Tuberculosis Disease section.
No	Negative	No	CXR not recommended unless the patient has HIV infection or other forms of immunosuppression are present	▪ Classify as Class 0.
No	Positive	No	CXR Required: Yes Results: normal	▪ Classify as Class 2. ▪ Consider treatment for LTBI. Refer to the Treatment of Latent Tuberculosis Infection section.
			CXR Required: Yes Results: abnormal noncalcified fibrotic lesions suggestive of old, healed TB; comparison film available and stable	▪ Classify as Class 4 or 5. ▪ Consider evaluating for TB disease. Refer to the Diagnosis of Tuberculosis Disease section.
			CXR Required: Yes Results: abnormal consistent with TB disease; no comparison film	▪ Classify as Class 3 or 5. ▪ Evaluate for TB disease. Refer to the Diagnosis of Tuberculosis Disease section.

Definitions of abbreviations: CXR = chest radiograph; HIV = human immunodeficiency virus; IGRA = interferon gamma release assay; LTBI = latent tuberculosis infection; TB = tuberculosis; TST = tuberculin skin test.

Resources and References

Resources

(For easy access to references, hyperlinks are provided for online references in the list below.)

- ATS, CDC, IDSA. "Diagnostic Standards and Classification of Tuberculosis in Adults and Children" (Am J Respir Crit Care Med 2000;161[4 Pt 1]) at: http://www.cdc.gov/tb/publications/PDF/1376.pdf
- CDC. Self-Study Modules on Tuberculosis (1999) at: http://www.cdc.gov/tb/education/ssmodules/default.htm
- CDC. Core Curriculum on Tuberculosis (2000) (November 2001) at: http://www.cdc.gov/tb/education/corecurr/index.htm

References

[1] CDC, NTCA. Guidelines for the investigation of contacts of persons with infectious tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. *MMWR* 2005;54(No. RR-15):13

[2] CDC. Targeted tuberculin testing and treatment of latent tuberculosis infection. *MMWR* 2000;49(No. RR-6):23.

[3] 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):15.

[4] CDC. Classification system. In: Chapter 2: transmission and pathogenesis. *Core Curriculum on Tuberculosis (2000)* [DTBE Web site]. November 2001. Available at: http://www.cdc.gov/tb/education/corecurr/index.htm . Accessed March 4, 2010.

[5] CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR* 2005;54(No. RR-17):4–5; CDC. Targeted tuberculin testing and treatment of latent tuberculosis infection. *MMWR* 2000;49(No. RR-6):7–9, 22.

[6] CDC. Targeted tuberculin testing and treatment of latent tuberculosis infection. *MMWR* 2000;49(No. RR-6):8-9.

[7] CDC. Targeted tuberculin testing and treatment of latent tuberculosis infection. *MMWR* 2000;49(No. RR-6):11; CDC, NTCA. Guidelines for the investigation of contacts of persons with infectious tuberculosis: Recommendations from the National Tuberculosis Controllers Association and CDC. *MMWR* 2005;54(No. RR-15):13; County of Los Angeles Tuberculosis Control Program. *Tuberculosis Control Program Manual: 2003 Edition*:2-1. Available at: http://www.lapublichealth.org/tb/TBManual/TBmanual.pdf . Accessed March 4, 2010.

[8] Francis J. Curry National Tuberculosis Center. *Diagnosis and treatment* [Francis J. Curry National Tuberculosis Center Web site]. Available at: http://www.nationaltbcenter.ucsf.edu/abouttb/diagnosis_and_treatment.cfm . Accessed March 4, 2010.

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[10] CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR* 2005;54(No. RR-17):49.

[11] CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR* 2005;54(No. RR-17):50.

[12] CDC. Candidates for treatment of latent TB infection. In: Chapter 6: treatment of LTBI. *Core Curriculum on Tuberculosis (2000)* [Division of Tuberculosis Elimination Web site]. Updated November 2001. Available at: http://www.cdc.gov/tb/education/corecurr/index.htm . Accessed March 4, 2010.

[13] Sepulveda RL, Ferrer X, Latrach C, Sorensen, RU. The influence of Calmette-Guérin Bacillus immunization on the booster effect of tuberculin testing in healthy young adults. *Am Rev Respir Dis* 1990;142:24–28.

[14] CDC. *Core Curriculum on Tuberculosis (2000)* [Division of Tuberculosis Elimination Web site]. Updated November 2001. Available at: (Chapter 9) http://www.cdc.gov/tb/education/corecurr/index.htm. Accessed March 4, 2010.

[15] CDC. *Core Curriculum on Tuberculosis (2000)* [Division of Tuberculosis Elimination Web site]. Updated November 2001. Available at: (Chapter 9) http://www.cdc.gov/tb/education/corecurr/index.htm . Accessed March 4, 2010.

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